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ELECTRIC EEL CALLING



WITH ILLUSTRATIONS BY THE AUTHOR

Electric Eel Calling

*A RECORD OF AN ARTIST'S ASSOCI-
ATION WITH A SCIENTIFIC EXPEDITION
TO STUDY THE ELECTRIC EEL AT SANTA
MARIA DE BELÉM DO PARÁ, BRAZIL.*

SHELBY SHACKELFORD

NEW YORK · CHARLES SCRIBNER'S SONS

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For

*“King David,” Dr. Herman Baruch,
whose imagination and generosity
are as phenomenal as the behavior
of the electric eel.*

ACKNOWLEDGMENT

On opening this book it is quickly obvious that it is written from the viewpoint of the artist, but I have taken care in discussing the research on the electric eel, which forms the thread of the narrative, to submit all of it for correction. Also I have taken the liberty of supplementing findings made in Pará with others made before and since in New York so as to include as much material as possible on the subject. These have been technically reported in articles appearing in "Zoologica, Scientific Contributions of the New York Zoological Society," between the years 1936 and 1940, by Mr. Christopher W. Coates of the New York Aquarium, who acquired specimens of the electric eel for the Aquarium in 1934 and has been active ever since in promoting and carrying on research on them; and by Mr. Robert S. Mathews and Dr. Ross F. Nigrelli of the New York Aquarium, Dr. Richard T. Cox and Dr. Louis P. Granath of the Department of Physics, New York University, Dr. George M. Smith of the Yale University Medical School, Miss Janice A. Cutler of the Department of Chemistry, New York University, Dr. M. Vertner Brown of the Department of Physics, College of the City of New York, Mr. Walter A. Rosenblith of the Biological Laboratory, Cold Spring Harbor.

For the use of photographs which I used as material for some of the drawings I wish to thank Dr. Robert C. Smith

of the Hispanic Foundation, Library of Congress, and Mr. Robert Mathews.

To all those people in Pará who taught us many things about a new world, I would send thanks, and especially to Dr. Godofredo Hagnann, Dr. Gunnar Pira, and João of the Museu Emilio Goeldi, Mr. Karl Griem, Sra. Catharina Magno de Miranda, Sr. and Sra. Eladio da Cruz Lima, filho, Mr. and Mrs. "Jimmy" James, "Antonio" of the Grande Hotel, and for "Chico" who joined us in America and proved the most charming of all possible envoys of good will from Brazil.

CONTENTS

PART ONE

1. <i>One Hundred Miles South Equator</i>	3
2. <i>A Place to Work</i>	12
3. <i>King David Makes It Possible</i>	27
4. <i>Electrophorus Electricus</i>	36
5. <i>Names for It</i>	43
6. <i>Look as a Painter</i>	53
7. <i>Observe the People</i>	66
8. <i>These Are the Wonders</i>	84
9. <i>The Padre</i>	98
10. <i>Conversion</i>	107
11. <i>Almost Virgin Forest</i>	116
12. <i>The Zoologist and His Children</i>	124

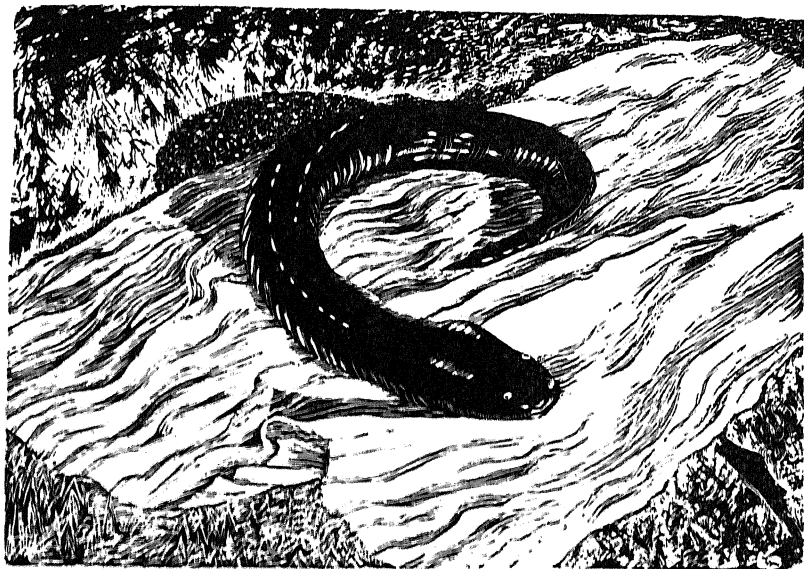
13. <i>As the Oscillograph Translates</i>	134
14. <i>The World</i>	144
15. <i>Good Friday</i>	150

PART TWO

16. <i>Communication</i>	157
17. <i>Friday, April 9, 1937. Dock 9</i>	172
18. <i>"Não Há Piraquês Aqui"</i>	191
19. <i>Marajó to Marguary</i>	198
20. <i>Politico</i>	211
21. <i>Eel Data</i>	221
22. <i>"Always Come"</i>	232
23. <i>Adeus Santa Maria de Belém!</i>	243
24. <i>May Sixth, 1937</i>	256

ELECTRIC EEL CALLING

PART ONE



1. ONE HUNDRED MILES SOUTH EQUATOR

TO TRAVEL three thousand miles is not the quickest way to get an electric eel, but it is the surest, and for that reason we are here—one hundred miles south equator.

The dark clear waters of the ocean cease to reflect the blue sky; they become cloudy, yellow-brown, so dead a color, they have taken on a surface quality quite alien to their recent clarity. We had not seen the sea like this before. This water had become part earth—the Amazon has come to meet us.

In its swift surge across the whole north of South America it has brought a portion of that earth with it. The innumerable small tributaries have dug at their bottoms and

along their sides and poured their findings into the Amazon. With the actual substance of soil have come strong dyes which the water has washed from the plants along the shores. The red of brazil-wood, the black medicinal waters of the Negro, the white earth of the Branco, have now become mixed by the rushing Amazon to so dull a hue that the very ocean seems to protest this uncleanness. New currents appear in the movement of the waters, great curving half moons, running south to west to north—pushing against the insistence of the earth-filled Amazon.

This first sight of South American earth does not satisfy us. After twelve days of water, we want to see solid heights of land cutting into the horizon. When it comes it looks no more than a short streak of uneven grayness against the sky. No different from the moving clouds except it stays there, small and solid. There is land!

Always I had thought the first sight of Brazil would be red. Not just reddish, but flaming against the sky. Earth lying about the equator with the tropic sun blazing down upon it, earth holding the heat, houses too, made of that same earth, hot even under the shade of trees; this to a North American, who, looking at the maps, had seen that Brazil lay in the area of greatest heat in the Western Hemisphere, could not be a country gray in color. And the name—"Brazil" from "brasa" a Portuguese word, meaning live coal. Almost any dictionary will tell you this, and I would like to leave it there to complete the picture of the heat I had imagined, but in honesty I must continue. The word "brazil" was originally applied to wood which gave a strong red or yellow dye, and because this country of

northern South America produced that wood in quantities, a long-dead king of Portugal gave it this name. The year 1500 is not too far back for psychological reactions to parallel the present ones, for then the color impression of red dye became translated into heat—"brasa," live coal, and so Brazil. And still thinking of this hot land I saw the color red.

That far unmoving grayness not only was land but had a name—"Marajó." The captain leaned against the deck rail, "Islands, islands, everywhere, could buy one for fifty dollars; beautiful to look at, but you wouldn't last three days there; no water, but snakes, mosquitoes, chiggers—you'd go mad. You can have the islands—along with your electric eels." Scientists are slightly crazy, anyway, he was thinking. Now these eels—for what in God's name would any one want to go "studying" them? Devilish creatures—knock you out, if you get mixed up with them in the water—no good for any known use, but do plenty of damage.

I looked at the captain, he was an Englishman, short and sturdy, molded for action and the obvious. Forty years of the sea, strange ports and stranger people had given him unusual knowledge, but there seemed no end. This time it was electric eels. He looked at the brown water, the myriad islands rising from it like green-frothed birthday cakes; he was sick of it, he would go back to the English countryside, an inland place where there's no sea even to tempt one.

"Take it!" he said, shooting his hand forward suddenly, as though, with that gesture, he could be released.

I took it. The islands, the Amazon, the unknown world

beyond, were mine. A swift feeling of uncertainty struck me. I, who had been a dweller on the island of Manhattan for the past ten years, was now faced with this immensity.

A passenger, who was a physicist, and therefore acquainted with numbers, calculated, "The Amazon Basin is so vast and so thinly populated, that if all its people were taken and stationed an equal distance apart over all its area, and shouted to their utmost at the same moment, no living man would hear the least faint sound. The sounds from all those thousand throats would, at most, scatter a few animals and birds, each startled by a single man's cry."

"And," I asked, "if you gave the same space to each inhabitant of, say, Manhattan, how much of the world's room would they need?"

The Physicist pondered a moment, smiled, and answered, "They would overrun the states of our Atlantic Coast, the West Indies, and the coastal countries of South America—even far enough to meet us here upon the Amazon."

But they all stay within that rectangle of twenty-two square miles! We, for a moment, had escaped, we were about to touch a land where there is unrestricted crying space for all. Yet even here it is not so evenly apportioned as the Physicist envisaged, for against the great uninhabited areas the dots of cities fall at long intervals, rimming the coast and straggling up the rivers. They are as overcrowded as our North American cities, but for a more valid reason—Nature. In northern Brazil, the actual presence of the great forests, rooted in land so low that much of it is flooded half the year, and producing a thorny matted vegetation, places a physical barrier to "civilization"

in its own specific fashion. Man may drain swamps, clear forests, and build a city, but in a land where moisture and heat are all pervading, the weakest plant life is endowed with a quick, never retarded growth, against which man must ever be on guard unless his city be invaded by the forests—his streets overgrown and the very stones of his buildings pushed apart by some strong seedling. Of this we have no understanding in North America.

The tide was turning, the ocean was beginning its six hours of withdrawal from the land. This would hold back the ship some time longer. It was a slow advance against both the pull of the tide and the push of the Great River. "The Great River," the "Mar Dulce," the "Marañon," the "Orellano," eventually the "Amazon."

The names fall out, one upon another, urging you to find out their wherefore. This vast river world, only half known, has a history so wrapped in legend, that even the name "Amazon" is debated, as to whether it sprang from a legitimate source, or from the imagination of a Spanish adventurer. For, to have been coming down a wild, unknown river of South America for a year or more, to have been in apprehension of losing one's life daily from disease, river currents, starvation, encounters with the Indians, might put any one in a state of credulity for the most fantastic of stories. Not hard then to believe that suddenly you were set upon by female warriors, fiercer and more intrepid than any fighting man yet encountered. It seems certain that the Spaniard, Orellano, had no doubt that this happened to him.

Orellano, captain of Gonzalo Pizarro, brother to that

famous near exterminator of the Incas, crossed the Andes from Peru to look for the Land of Cinnamon. The taste of spices upon the palate has caused more worlds to be discovered than any other thing. Man's imagination, prodded by the delicate flavor of seed growth on certain trees, vines, and bushes, starts him forth in search of these, and one finds America, and another, only a little later in that same America, scenting cinnamon, explores the greatest river of the world. And because of this chance encounter of Orellano with the fighting females, real or imaginary, this river is now called the "Amazon."

Our ship had long since passed the mouth of the Great River, we were some miles up the Pará River, through which part of the water of the upper Amazon flows to the sea. There was land upon both sides; to the left, the unbroken mainland, to the right, islands still, near and far, changing shape with the movement of the ship. It was almost noon, full sun revealing the distant outline with metallic precision.

I raised binoculars to my eyes and saw trees massed solid as a wall, pushing, shoving, crowding against each other, thick and shining green. The jungle. No sign of human life, no animal, no bird; forests impenetrable. Perhaps the earth beneath is red, after all.

Beyond these islands, up into the tributaries of the Amazon, the waters are thick with dangerous life. There is the caiman, most ferocious of alligators, vicious and strong enough on the day it cracks its shell to remove a man's finger; the paranha, innocent-looking fish, no longer than a foot at maturity, but able and willing to strip your bones of all flesh so swiftly that unless help comes at once it is

too late; there are others; and the one we had come this long journey to observe and to try to find the "why" of his peculiar power—the electric eel.

I was glad to find my horizon suddenly contracted by the sight of a more tangible object, and a gentler one than those I have been imagining. A bird had come to meet the ship. He flew about it seeking landing, and alighted upon the farthest outthrust of the bow. He was tired, and glad to sit there, balancing with slow, sidewise movements of his neck. He was tannish brown, long beaked, webbed footed—a booby. He had no fear and we came within an arm's length of him, close enough to see the dark radiating streaks within the light gray eyes. When he had rested, he rose again into the sky, and was soon lost in the sharp brightness.

We watched him, envious—our approach was too slow for our eagerness.

Away upon the mainland, a city could be seen just rising above the treetops. The skyline mounted only with the towers of the Cathedral and an occasional church spire. The houses in which live nearly three hundred thousand souls lie close to the flat land, almost obscured by thick tree growth. This slight break in the jungle is the city which controls the traffic of the Amazons. Through its port pass all who would have contact with the upper basin and bring its profuse, wild products to the world. For three hundred years this land has been the battleground of Spanish, Portuguese, French, Dutch, Indians, and eventually Brazilians. We are told that there is peace now, even though at that moment martial law controlled.

Here was Santa Maria de Belém, "Mary of Bethlehem,"

capital of the State of Pará, sometimes called Belém though more commonly Pará.

Forces beyond man's control have dictated almost the exact position of this port, placing it, not at the mouth of the Amazon proper, but upon the Rio Pará—a smaller outlet of the great river which washes south of vast Marajó Island. On the north side where the torrents of brown Amazon water rush into the Atlantic, opening a mouth one hundred and fifty miles across, the moon does strange things with the ocean. The tides do not move with an ordered ascending and descending which allow man his calculations and ensuing mastery. They have their own capricious way, and man looks on. With the tides of the full moon the ocean hurls itself upon the Amazon and there is so great a struggle that the waters rise into a wall thirty feet high. The Amazon is defeated and her current reversed for four hundred miles, flooding the surrounding land. The Indians retreat quickly with their few belongings, but it is obvious that a city cannot do likewise. And what, should there be a ship sailing in or out at this time? It seemed simpler to have the port of the Amazon in a less dramatic situation.

As we approached, the dull waters became flecked with bits of brilliant colors, moving forward, swinging sideways, blown by the wind.

"Are they birds?"

The first mate laughed, "The fishermen are out. You see their sails."

Red, blue, white, dark brown, flying toward us.

The first mate continued, "Marvellous sailors, mostly Indians, stay out for days in those boats, miles from land,

no compass, no charts, navigating by the sun and stars."

I remembered that the night before we had crossed the equator, the North Star had been low against the horizon, another night it would be lost to view.

"What star do the sailors use to guide them when the North Star cannot be seen?" I asked.

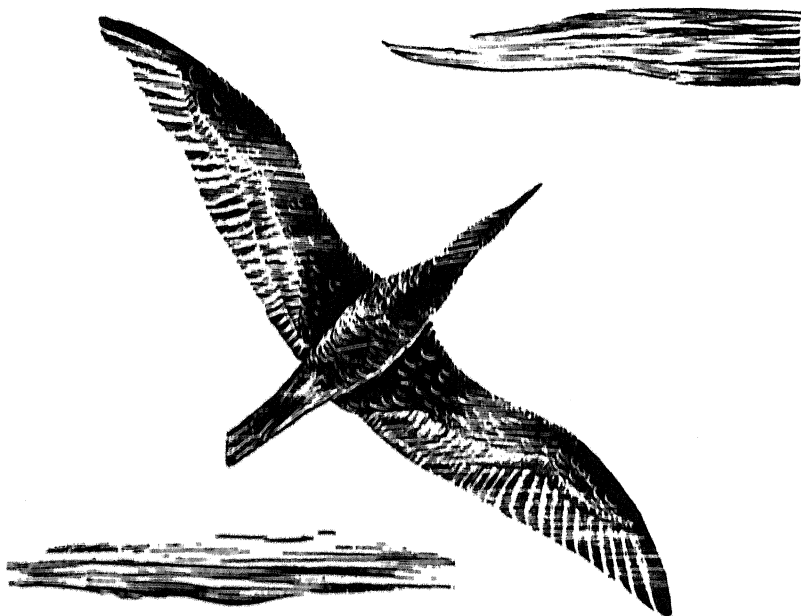
"What star?" repeated the mate. "All of them."

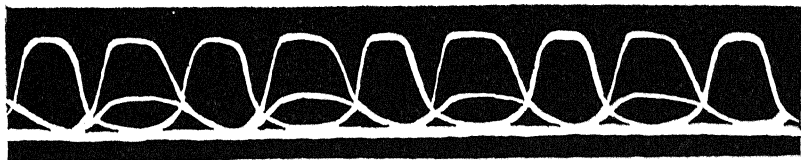
"Yes, but is there no fixed star in the south?"

"None."

A night sky with no fixed star, all of them wheeling by us. No surety for mariners in the heavens, no star that even little children learn to find.

"Mary of Bethlehem," receive us.





2. A PLACE TO WORK

OUR BOAT was slowing down, stopping. Tugs were shoving their short noses toward us. From them came—Brazilian doctors, officials for passports, customs officers, ebony women to carry off great white puddings of laundry on their heads—last, a rush of porters and their retainers.

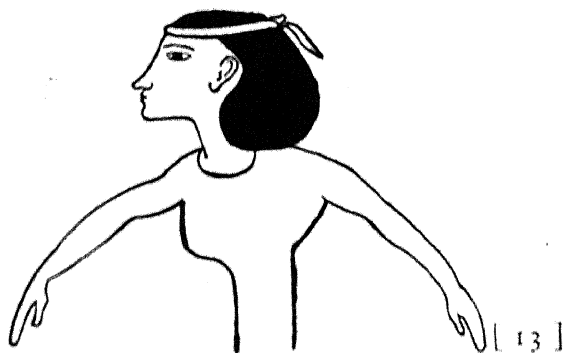
The breeze we had had, while the boat was moving, stopped. Dull heat was upon us, too, and a stench of human sweat. All crowds have a smell and different as the country to which they belong. I understand that the Japanese are particularly sensitive to odors. Their crowds smell like geraniums, they say, ours like nothing on earth. "Nothing on earth" is apparently unequalled vileness. This—like plain sweat. Forget the stench or hold your nose if you must, but do not cover up your eyes. Look at all these faces. First those in the saloon, their bearers spreading themselves with official superiority in the wicker chairs of which the captain is so fond. Spreading out their portfolios and papers upon the tables, picking up their pens to check our names. They had them all there and for what reasons we had come this long journey, and inconveniently arrived at the hour of two o'clock to thus disturb their siestas.

The three who belong in this story's future are there, passports unfolded, ready for inspection. Each looks down upon the unflattering likeness of himself pasted on it and his eyes review the formal unimaginative description attached.

The first sees himself recorded thus: Height—5 ft. 10 inches; Weight—150 lbs.; Hair—brown; Eyes—blue; Nose—straight; Mouth—small; Distinguishing marks—none; the age by calculation—27; Occupation—student of Biology. It says nothing of the quick intelligence in the blue eyes, or the habitual restlessness of mind and body which was more descriptive of him than any tabulated portrait.

The second, Height—6 ft. 3 inches; Weight—160 lbs.; Hair—dark brown; Eyes—dark brown; Nose—straight; Mouth—medium; Distinguishing marks—none; Age—38; Occupation—Professor of Physics. There is nothing unusual here, except the height; no mention of his long mobile fingers which might be the envy of any pianist, or that there is about him an abstract quality, a separation from worldly objects which adheres to the best tradition of how a scientist should look.

With him goes: Wife—Height—5 ft. 2 inches; Weight



—105 lbs.; Hair—brown; Eyes—brown; Nose—straight; Mouth—large; Distinguishing marks—none; Age—37; Occupation—Artist. This is “I.” As a child I was told that I looked like my father’s family, but when I left Virginia and met a world where Pharaoh was better known than my father’s family, I was told that I looked like an Egyptian bas-relief.

The Biologist and Physicist are here for purposes of scientific study, relating to the electric eel, and I have been put down as Artist of the expedition, this giving me a legitimate excuse to accompany the Physicist.

We move up before the doctor, a big man, the only tall one in the lot, immaculate in white. He was olive-skinned, with longish hair, loosely kinked. Slowly he moved his pen among the alien names as passengers appeared. A husband’s vaccination certificate apparently certified the immunization of the wife also, and a dog’s vaccination against rabies took care of the little girl, his owner. It was somewhat disconcerting to the passengers, but the doctor continued, unmoved, his slow checking. We spoke no word of Portuguese and he, no English; we wondered if he read it. His job was to check the names, and this he did at length.

We move across to a small, dark official, fussing with pen and papers. Beside him stands a red-black man in blue. Sharp, black eyes are turned upon us, features otherwise immovable; high cheekbones, high arched nose, mouth thrust forward, hair black and tightly kinky—Indian and Negro.

He was uniformed, a policeman, I was told. His ancestors had been free, naked, living upon the land—going

beyond and back to a civilization before ours, perhaps. I did not know, he did not know; knowing his mother, perhaps his father, was enough for him. For me, I wondered to see all this wild heritage poured into a uniform. Indians from the interior, drifting into the cities, mate with blacks



from the Barbadoes, whites from other lands, making variations interminable. Mostly left to live as they can, they are sometimes taken on as government employees—and here was one. He seemed to like it, but his hands cannot now turn the earth into objects of man or beast or

bowl. He cannot sit indolent and let the air cool his body as the others did, he must sweat with collar tightly closed. He stood there, brass buttons down the front, immovable except the restless eyes. He saw me looking at him curiously, he looked at me but less so. He had been out many times to meet American and English ships, he had seen our breed before. I smiled, the tenseness of his face relaxed in amiable response. Here was the first greeting from Pará, quality reminiscent of the Negroes of my childhood.

More papers, more officials, baggage hauled about, passed at last, and we also, to the waiting tug which made its way to shore with undeviating doggedness while the gay sails on the fishing boats dipped and swirled in the quick wind. The wind was rising, the sky darkening, suddenly the rain, straight and hard and cool—the rainy season.

The tug reached land, a mass of blue-clad figures leaped aboard. Brown and black faces surrounded us, brown and black hands gesticulated wildly. Strange, urgent, incomprehensible phrases shot into our ears—baggage, yes, that was it, but there was not enough to go around, not half enough and ships were scarce. We were hurried to an automobile of North American make, large, with room to spare. "Put the bags here," I say.

"No, the men will carry them."

"All the way to the hotel?"

"Yes, it is the custom."

There were no pushcarts, no trucks, the porters put everything upon their heads and walked.

I should like to have walked too, though not with luggage on my head. I wanted to feel the unmoving earth

beneath my feet after so much unsteady sea. What if the whole world spins one thousand miles an hour, it is yet still, I had felt it so. I wanted, too, to enter more slowly into this new city. But no, with terrific speed the car rushed down the main thoroughfare. We sensed high, dark trees above us—gaily painted houses blurred the sides. I felt as though we had fallen into a gigantic kaleidoscope. Color blurred and whirled about us.

The car stopped abruptly and we were asked to step out. Here was the Grande Hotel; lobby opening upon the street, tall doors one step up from the pavement, tall rooms, thirty feet high. Top floor we go, by elevator. The porters, still balancing their heavy loads, walk the long stairs.

Bedroom to the back, now, closed windows opened for us to see outside. Light burst upon us, sky forever, white clouds piled about—lean out and pick a piece of one, like cotton, there are plenty more. Look down, too, dazzle of red-tiled roofs stretching under this sky, palm trees against it in the distance, strip of green meadow in between, beyond, brown streak of the river, again forests impenetrable. Quick drawing in of the breath. This to look upon for three months, but how afterwards to endure houses in uninterrupted closeness?

If we wished, we might dine now at a still table. Inside the high-walled dining room the fifty little tables looked like doll's furniture, catering to a bunch of puppets. The waiters bear in food of Brazil, bewildering in its profusion --crabs, fish, meat stews, chicken, beefsteak, fried potatoes, three and four times at one meal; bread, tough enough to break one's teeth; green vegetables of unexciting taste, and

these quite new to the country since the Japs arrived and took to farming this rich land. Cheese, and good; tropic fruits—pawpaws, alligator pears and small yellow bananas; thick fruit pastes, coffee, black and bitter—half a sugar dish to sweeten a pot; native wine or beer, if you will, or those of foreign makes—this was dinner.

Rest now upon a still bed.

The first night of sleep in a new place is always broken, the subconscious senses aware of unfamiliar sounds, and I was rather glad at length to be awakened fully. Bells were ringing all about the town, clamoring wildly. I started up, perhaps there was a fire. Gray morning came in at the window and I looked out to see if I could locate this tumult of bell sound. The city seemed very peaceful. There were people in the streets, but no one hurrying. There was no sign nor smell of smoke, no fire, after all.

But again the urgent bells. Now I could locate the sound of one. It came from a sharp-spined church in a tiny tree-filled square. People were going across the square and entering the church. I looked at my watch, it was six o'clock, and this was Sunday morning in a Roman Catholic country. The bells meant early mass, but there was no "opiate of the people" sound in their sharp insistence.

We breakfasted at seven—rough bread, strong, bitter coffee, hot milk and sugar, nothing more. Our American-trained stomachs were very empty before lunch.

Immediately after breakfast we were taken to the Museu Goeldi, to see the laboratory put at the disposal of the Scientists from America. The elderly Swiss zoologist in charge met us, kind hospitality in his smile and handshake, apologies for the weather, the rainy season, an umbrella

for the protection of "the lady" during the intermittent showers.

The Museu proper, an oblong two-story building, could be seen from the entrance to the gardens. Its wide stairway on the outside, mounting to the second floor with long, low steps, offered a leisurely approach to the inanimate exhibits housed beyond the tall arched doorway. But this time, we did not enter, our curiosity to see our own workroom was uppermost. The Zoologist took us toward a one-storied, verandahed building. One of the three rooms it contained had been cleared for us. It was large and white-tiled, the close trees outside almost thrust their branches through the wide windows. The smell of earth and growing things was in it. This was no laboratory as we had known them in the city. This was not a place where life was isolated to the experimental table. It was a clear space in nature, that was all. You could feel it in the trees if you stretched out your hand, and if you waited a little while it would come in with a stray butterfly, or an exploring monkey, and it was always there with that heavy odor of profuse vegetation.

The room was equipped with tables running the length of the walls and down the center. There were sinks with running water, connections for electricity and gas. There were a man and boy for our help.

"I hope it will serve," the Zoologist was speaking.

Surely there could be no uncertain note in offering a place like this! The Physicist marvelled. All the years of work in New York had been for him basement years both dark and damp, time for experiments squeezed out after long hours of teaching, administrative work, and clamor-

ing family. Here, for the first time, was space and leisure for discovering.

But three months is so short a time!

The Physicist moved his long fingers across the shining surface of the tiled table, he noted the position of the electrical outlets. Already he could see how the experimental equipment would be arranged; yes, there was ample room. He turned toward the Zoologist. "It is perfect, beyond what I imagined possible." He had not quite gotten out of that basement in New York.

"I will show you now my room."

The Zoologist's stronghold. His room duplicated ours at the other end of the building, but there was no shining emptiness about it, it was full to overflowing; tables of jars of pickled animals—fish, frogs, snakes, embryos, and things innumerable; shelves of dried birds, monkeys; boxes of moths, butterflies; cabinets of bones; tables covered with bones; desks covered with bones; shelves of assembled bones, skulls, mostly simian. These last, clean and beautiful in white smooth texture, delicate in line, were a sight to stir an artist as well as a scientist. The preparation of these skulls was the Zoologist's specialty. He had, too, a unique way of cleaning them. By soliciting the aid of ants, the skulls were stripped of all flesh. A head, with the skin removed, was placed in a tin box, with holes made in the top, openings proportionate to the size of the ant desired, and their size, in turn, fixed by the skull. If ants too large got in, the skull is found ripped of all cartilage even. One must here have the knowledge of exact relation. This realized, and the boxes placed in the tall grasses outside, the ants advanced to fill their crops, and

unconsciously, at the same time prove an aid to science.

Beside the ants, the Zoologist had put to use many of the offerings of this country. Far in the interior, beyond Santarem, next city up the Amazon from Pará, he had a large estate cleared out of the wilderness. He had imported milk cattle, and now ran a dairy farm for producing butter. There was also a garden, fruits and vegetables of perfect growth, parented in the United States of America. The wife of the Zoologist and their two daughters maintained here a meteorological station. For thirty years they had not only felt the rain, heat, wind of the interior tropics, but for some twenty, had recorded them as well. The Zoologist divided his time between this far world and the Goeldi Museu. During spare moments he made beautiful, delicate drawings of his zoological exhibits and, after showing them, folded them away again quite unconcerned with any effort at finding a wider public through publication. Here was science for art's sake alone.

The rain was stopping. "Now we shall see the gardens."

A zoo with only one walled house, and this for aquaria. No smells to be endured, contemplation freed accordingly. There were tall adequate cages for the monkeys, birds, and snakes; fenced-in living quarters for rhea, deer, and tapir; houses and running space for jaguars, small foxes and other beasts. Outside of all enclosure, running free and tame, are peccaries, gray and bristly, raising their stiff hairs in enjoyment of being scratched.

Agouties, gray or orange, run on fragile limb and tiny feet—one mother has a baby and the baby has a hole, always a hole, beneath root or drain, for hiding when

strange creatures come too close, quick entrance for the baby and departure of the timid mother. Here the egrets and ibis walk solemn and unmolested.

There are monkeys outside, too; Chico, a year-old woolly, spoiled as a baby, clinging tenaciously with tail and all four limbs to any friendly back or shoulder, chattering and grimacing, or curling up and sleeping on any scientific desk. Preta—the spider monkey—dashing about the grounds with ludicrous out-thrustings of long attenuated limbs, or swinging surely from tree to tree. Then aloof and superior in size and years, a great woolly, sitting indolent on top of one of the monkey houses, hanging over the edge like a medieval gargoyle, surveying the world with wrinkled, human face, bored with the security of years of people providing food and shelter. Here was simian disdain of other simians, responsibility-seeking and civilized.

The moving always demands attention first, but for later more leisured moments the garden had a full offering of trees and flowers.

We walk the gardens from end to end upon the clean white paths and at length are halted before what looks to be a large drinking fountain of the rustic type. A trickle of water falls from an opening in a rock and splashes into a semicircular basin. The water disappears under the rock, and when we look into its depths we see nothing at all but the reflection of the trees or a wavering image of ourselves.

Above the fountain is a sign saying, "Cuidade! Pura-qués!"

We look again, but see nothing to beware of, when



the Zoologist advances and raps with his hand upon the side of the basin. He raps several times and then we see the broken shadows unite into one long one which rises slowly to the surface. It is joined by another. A blunt fish snout is pushed out of the water and we are treated to a full view of a mysterious animal interior.

"No," says the Zoologist to the eels, "not dinner—visitors." We accept the introduction, and move up for mutual inspection. What their side of the story was, I never knew, but I, for one, felt this was no common meeting. I watched their black bodies slipping through the water with a motion so unhurried they scarcely made a ripple to vary the pattern of the spreading circles caused by the drip of water from above. They were almost self-effacing in their quiet movement.

Gentle, soporific, if looked at only—but draw closer and dip your fingers into the water—you would start then with so undignified a twitching of the body, it might be considered a prelude to a hula-hula. You would understand the "Cuidade! Puraqués!" and take advice hereafter.

"All right," I say, saluting their invisible strength, "you've got the upper hand, I'll admit, you've got the juice we haven't, but, one thing, we'll find out the how and why—and that you'll never know!"

The long black bodies turn upon us and, unimpressed, return to the cool depths from which the false promises of food had lured them. We stand a moment, thinking. Idiot man, or perhaps sublime, the sole creature up from the slime who spends half his lifetime trying to find an explanation for the behavior of all the others. Being sim-

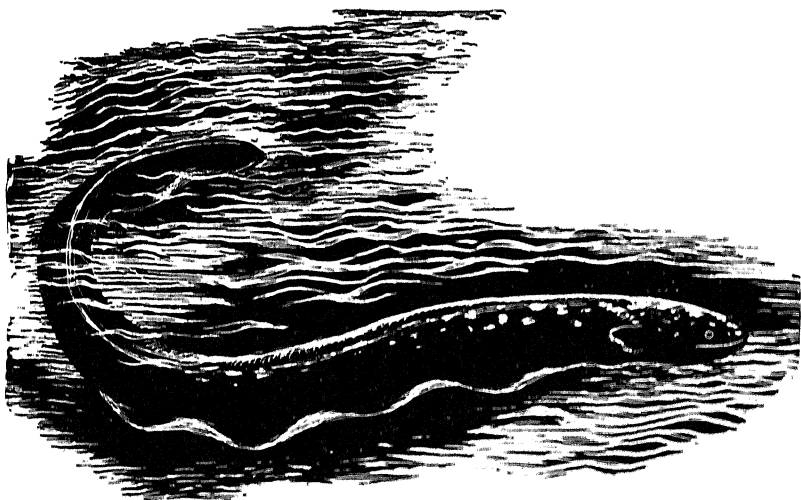
ian, this is no doubt better than to scratch, but to reassure myself of superiority, I do as the Zoologist had done and rap upon the sides of the basin. It helps to obtain obedience from those dangerous inhabitants of the Amazon, to have them come when called as though they were Persian kittens. Even Jupiter, upon occasion, wanted to be told he looked a man.

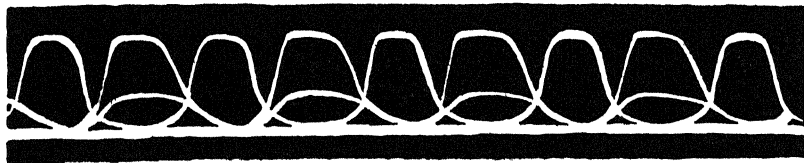
The Zoologist was leading us from the shade of the gardens, toward a group of ponds lying in the full sunlight. We pass several where fish darted between the clear spaces and the roots of the surface plants, and stop before one whose water is quite muddy, and which seems uninhabited save for a quantity of tadpoles squirming about the outer edges. I hear the Zoologist explaining that beneath the cloudy surface are twenty eels, brought here for the use of the scientists. The water in this pond cannot be kept clear as the eels continually stir up the mud in its bottom by their burrowings. All we see therefore are the tadpoles, and when I ask why the eels do not shock them, the Zoologist shrugs his shoulders. He does not know.

There are many things about the electric eel that people do not know. It is for the scientists to find out. Here is a place to work and here are eels. We take the latter at the word of the Zoologist; there are twenty eels in the brown water, whether we see them or not.

The heat of the sun is beginning to dance in waves above the sandy bank of the pond, and suddenly we realize that we are enveloped in it also. It strikes against our cheekbones with an intensity which rebounds and forms a quivering sheet before our eyes. The pond, the people,

and the earth move in a fashion unrelated to each other, and bound by no laws of gravity. Only the bare close-cropped head of the Zoologist stands firm in this mirage; it is like a gray rock in a moving sea. But it has been thirty years acquiring this stability. We who have not yet been here thirty hours beg retreat from this first encounter with the tropic sun at noon.





3. KING DAVID MAKES IT POSSIBLE

ALWAYS behind everybody's living there is a controlling force. I am not referring now to religious tenets, but to some factor which largely orders a person's living, and which changes from time to time or becomes replaced by something more urgent. It may be any of a thousand things which have grown slowly through tentative overlappings and confusions, until the thing we think we see behind us is too befogged for definition. It may be something as direct as poverty, or love, or hate. Sometimes it steps into our lives unexpectedly, and stands out sharply there for us to wonder at.

Something of this sort had happened to us.

It came first as a voice, a voice calling from New York to Washington, long distance. I was the one to hear it, and I was left incredulous. The Physicist had been wanted, but he was out, paying a last call at the Brazilian Embassy to arrange some matter in regard to our trip. We were to sail in three days.

The voice sounding from New York introduced the being producing it. The name had a ring of familiarity. I placed it as belonging to a well-known public figure, an astute businessman, concerned at times with policies of government.

"Yes," answered the voice, "he is my brother. I am a physician, and have for years been interested in the phenomenon of the electric eel. I understand that your husband is going to South America for the purpose of studying this. May I ask some questions?"

I answered—that for the past two years my husband had been working with electric eels at the New York Aquarium in collaboration with one of the staff there—a man whose alert mind saw in the unexplained power of the electric eel a fertile field of research. His inquiries concerning their behavior in their native waters had brought to light such amazing tales that the Physicist became curious to go to the source and pursue his findings. This year the Physicist was to have a sabbatical leave from the University where he had been teaching. And so in three days now we would be heading for the Amazon.

The Physician was attentive and interested and inquired, with apologies, whether the expedition was being financed by some institution. I said, "No," we had borrowed money which the Physicist expected to pay back by lecturing and doing articles.

The conversation was coming to an end; the Physician was saying, "I want to help you, I want to pay the expenses. You are very brave young people. Ask your husband to call me when he returns—charges reversed."

I had not thought of us as "brave young people," but I realized that something which had been pressing on me heavily was lifting; to be relieved of the financial debt would make the going easier, and the return less anxious.

The Physicist was slow in being convinced that such

a call had come. Such things just did not happen. I agreed with him, they did not, but perhaps the miracle was to come about. The New York physician was well known, his family was wealthy and had a reputation for philanthropy; but that we should be the recipients . . . of course the eel was responsible, apparently he could produce anything, this time it was money out of a hat.

Long distance was put through again, and that night the Physicist took the sleeper for New York to see the Physician. We were sailing in two and a half days.

That must have been an interesting meeting, I wish that I had been there. The Physician turned out to be all that the voice had claimed over the telephone, and more besides. He stood over six feet, almost as tall as the Physicist, upright with a magnificent head framed in white hair and beard; like King David, the Physicist said. There was an immediate rapprochement. The Physician was interested in the electric eel from the viewpoint of medical possibilities,—if certain experiments could be tried, he would be satisfied. The Physicist was uncertain—he was not experienced in biological research, but with the help of the Biologist, who had now joined us for the proposed trip, he would try.

We sailed the following day out of a harbor filled with quick diagonal falling snow and pushed by a hard wind.

It took us the full two weeks of that trip, that is—time left over from being seasick—to realize the subtle difference that this single happening would make in our living. Nothing was obviously altered; with the addition of certain experiments, work should be ordered as the Physicist had planned, but there was a free place in our minds,

where anxiety had been, now waiting for the new impression.

Now in Brazil we are ready to begin, only we must wait upon the customs officials, the brokers, the politicians; all those who have power to say whether or not a man enters their country, and what of his possessions he may bring in free of arbitrary duty. Permission of free entry for the scientific materials which we have brought, and upon which the experimental work is dependent, has not yet arrived from Rio. It is useless for the Physicist to argue that before he left the United States the Brazilian Embassy at Washington had received a cablegram from Rio saying the expedition was approved; they have heard nothing of it in Pará. We appeal to the American Consul, telegrams are sent, we wait—nothing. A call on the Governor of Pará brings word that he will communicate with Rio. The Attorney General of the State of Pará, who is at present assisting in the directorship of the Museu Goeldi, sends a personal appeal to the President. There is no reply. It seems that there is to be a presidential election in two years* and already propaganda takes all the politicians' time, leaving none for Americans concerned with electric eels.

Eventually a telegram arrives informing the American Consul that the affairs of the Scientific Mission are the subject of daily representations at the Foreign Office. We are encouraged. Five more days go by—nothing. The scientists have three short months for this work they have

*It has since been indefinitely postponed, and the question of succession has been settled by the President remaining in office under a new constitution of his own promulgation. This is known as "continuismo"—a good old South American custom.



come so far to accomplish, and the inability to get his equipment is pushing the Physicist to desperation. His usual calm is less obvious, he begins to mutter under his breath and I know that he is cursing mildly. The Consul sends another telegram to Rio, and receives word that the papers of the Scientific Mission were regrettably lost between the Foreign Office and the Ministry of Agriculture. The Consul intercedes with the chief customs inspector and is told to have the scientists submit a list of equipment most urgently needed. A long list is prepared beginning, "chemical materials, photographic equipment, books and papers," and trailing off into innumerable small articles. The broker had hinted that the inspector could not be too liberal, but might concede the first few articles, hence the grouping of the equipment.

It is as expected, the inspector looks at the list which he cannot read and is affronted at the greediness of the scientists. He enquires with dignity what is the least that can be gotten along with, and is told the first three items. He then sends a note to the appraiser on the pier ordering their release. The release entails the removal of everything except a set of taps and dies, the enumeration of which filled almost a page of the inventory.

As the appraiser sees all this leaving his custody, he makes one modest request. He is responsible for the retention of thirteen parcels. Will the Senhors please leave thirteen containers? The scientists comply and throw the equipment loose into a taxicab, leaving thirteen almost empty containers on the dock.

So, with governmental aid, work begins in the white and air-filled room at the Museu Goeldi. The tables be-

come cluttered with electrical and biological materials. The attendants there stand watching curiously or helping if a chance permits. The Zoologist hovers, kind suggestion coming in all five languages which he speaks.

I watch the installation as any stranger might, realizing that an "artist" is not needed, and that a studio is obviously a different place. I wonder how I can function in a laboratory.

I am not left long to wonder though, for without skilled help, any hand must do. All the weeks of preparation in New York had not been enough, there are still adjustments to be made. I am put to scraping wire, tightening screws, making purchases of, say—twelve empty bottles, two inches high. This last leads me to a Brazilian pharmacy, where I wait in line with those who have come for drugs for their ailments or for those at home. It is an unhappy group, only the poorer people, sunk in their own misery, or servants of the well-to-do waiting for their orders. There is no soda fountain to give the lighter touch, and the main portion of the store is railed off from the purchasers. They wait patiently their turns, and come forward to the railing to present their wants or receive their packages. The clerks beyond move between their mixing jars and drug supplies, clothed in long white coats and a solemnity which is awesome. Thus must the gods have moved upon shadowy Olympus, preparing life or death for the anxious mortals.

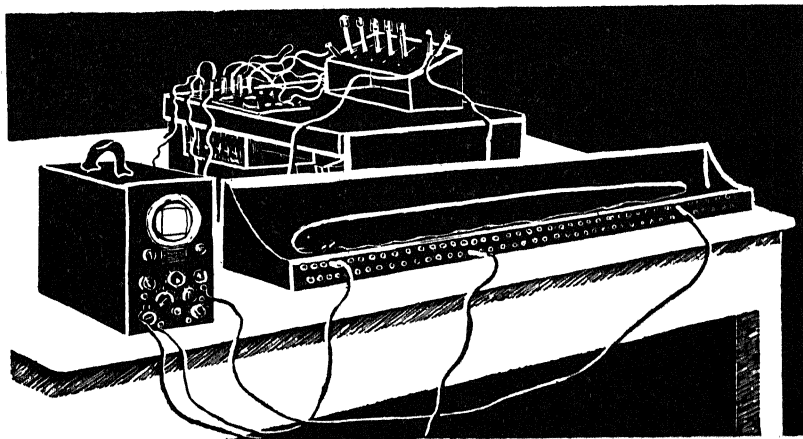
When my turn comes, I find to my horror that all these gods speak only Portuguese. I am reduced to an absurdity of monosyllables at which the small dark Olympian the other side the railing smiles wearily. I take out my ever

present dictionary and fumble through its pages. He watches me with the most disconcerting patience which only adds to my discomfort. Then I remember that I am an artist. My talent can be put to use, at last. Hastily I draw a picture of a squat wide-mouthed bottle. The Olympian seems unconvinced. A bottle, yes, but what is the desired contents? I shake my head, and finally find the word for "empty." This is too much. He turns gently from me. I stand there, trying to think of some other way to get those bottles. Just as I am about to take a high jump over that railing and seize what I desire, he comes forth again and places before me an exact duplicate of my picture. I am radiant and he is pleased also. Then I write the number "12." He gives me a flat "Não." I take up the struggle again. Fantastic ideas present themselves to me, for somehow I must make him understand that this is necessary. I will draw a picture of an electric eel and write "puraquê" beneath; then motions of his being chopped in pieces, finally a section is placed in a bottle and the top sealed down. This man must be made to understand that these sections are to be preserved and taken back to the United States for future study. And how can this be done if he will not give me the bottles? The pharmacist is quite sure now that I am less than sane, and in desperation decides to humor me.

With the triumph of twelve empty bottles, two inches high, safe beneath my arm, I pay the eight milreis, and leave. I could have had the bottles, full of almost anything in the store, for the same price, but then, I thought, considering what the man had been through, he was being very lenient.

Returning to the laboratory, I unwrap the bottles and arrange them neatly at one end of the table. They look innocent enough—a row of small glass bottles. But for me any one of them might contain a jinni. Just lift a cork ever so slightly and his amorphous form will slip out of the wide mouth and balancing precariously upon the window sill will give me that superior and weary smile which could come from none other than the pharmacist himself.





4. ELECTROPHORUS ELECTRICUS

VISITORS begin to come to the laboratory, for word has spread that we are here. The *Folha do Norte* has said it —“illustrious professors and well known artist . . . to study our electric eels.” No terminology passes in Brazil without some blandishment. Was not our male “criada de quarto” the “illustrissimo Senhor”? So then it was normal for us to be honored likewise.

The curious crowd about and ask the scientist to explain and demonstrate. A piece of apparatus is uncovered —a long wooden trough inlaid at close intervals with copper wiring. It stretches six feet long by one, a black abstraction upon the smooth white surface of the tiles. The abstraction continues, moving in twisted lines of wiring from trough to near-by rectangular box. The rectangular box is black also, dial faced and numeral dotted, with a shining white circular screen showing at a

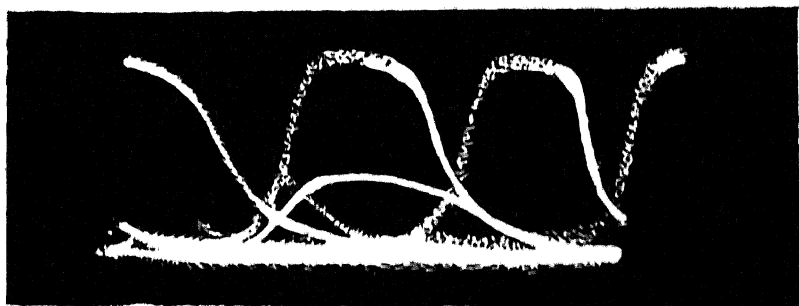
window in the end; a cathode-ray oscillograph. Although developed in the laboratory more than a generation ago, only recently has it been perfected in this convenient form in which it can be carried from New York to Pará and plugged into a power line with no more trouble than a vacuum cleaner. It is a voltmeter of a sort but very different from the ordinary voltmeter with its needle swinging across a scale. The needle of the cathode-ray oscillograph is a stream of electrons played across the white screen, which make the most mobile of all indicators because of their extreme lightness, so that they follow in their motion every variation in the transient voltage of the electric cel.

A three-foot cel is lifted from the water with cheesecloth about its body to absorb the slime so that it will not slip from the rubber-gloved hands of the Physicist. These gloves are necessary to insulate against the electric shock. The cel is then laid out upon the trough, touching the copper wires.

At the closing of a switch a spot of green luminescence appears on the screen of the oscillograph, faint at first, then brightly shining. This is where the beam of electrons strikes the screen. Another switch is snapped and the luminous spot starts tracing a line across the screen, one line over and over again. At the turning of a knob the spot moves faster and faster until it is too swift for the eye, and the luminous line stands unflickering on the screen. With the closing of a third switch the line of light becomes flexed and shimmering. The knob is turned again, slowly, and the luminescence comes to rest in a shape like a letter S fallen over.

Our visitors glance from the eel inert in the trough to the light just now so lively on the screen. The Physicist explains, this is not the *puraqué*, not yet. This is the voltage from the power line of the Pará Electric Company. From here to here, he marks the distance with his fingers vertically on the screen from the trough of the wavelike curve to its crest. This is three hundred volts. While from here to here, the horizontal distance from end to end of the curve, corresponds to one fiftieth of a second. That is the time in which the luminous spot crosses the screen.

"Now," he goes on, "I connect the *puraqué* to the oscillograph." Plugs with wires leading from them are set in two sockets on the side of the trough, one near the head of the eel, the other near its tail. Suddenly although the eel still lies inert there flash on the screen dancing curves, shining in green snakelike interlacings. These are the translation into visible form of the electrical discharge of the eel. The height of these curves, he points out, is about that of the wavelike curve seen before, so that the electromotive force of this *puraqué* is about three hundred volts also. And in the fiftieth of a second shown by the



sweep of the luminous spot, the fish will give sometimes one, sometimes two discharges.

The Zoologist translates and simplifies: "The electric eel is a sort of battery, and when he is laid upon these wires and prodded to give out a discharge, his electric power is carried by the wires to the oscillograph, where it produces the shining curves. There are different curves, apparently corresponding to the organs which produce them. By studying the electric discharge of the eel it may be possible to throw some light on the slight electrical impulses produced by the nerves and muscles of the human body."

The audience is respectful, but only when a little neon lamp is made, by eel power, to shimmer intermittently, is there wide-eyed and articulate amazement.

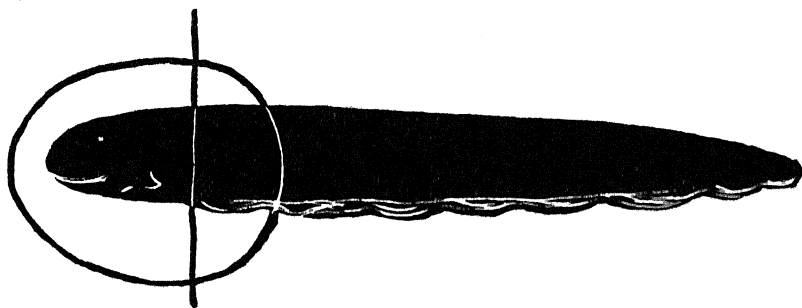
"If you don't believe your eyes," we say, "touch one of our *puraqués*." No one accepts the offer, the natives know too well his danger, and prefer a distance. The people here tell us, though, just what the shock is like, and what happened to João's brother when he met one in the river.

Explanation of how the eel is electric is more difficult, we hardly know ourselves. The biological construction has been investigated somewhat, and what has been found out we can repeat. For demonstration, an elongate snake-like form is drawn upon a sheet of paper, and divided into fifths.

"The first fifth," the Physicist explains, "at the end where you see the flattened head and beadlike eyes, comprises all the vital organs of the fish. In this small section of the whole, where the wide mouth takes in the food,

are the organs of digestion, elimination and reproduction; the heart, gills, and brain. The round small eyes, bluish white and sunken like the eyes of a dead fish, look unimportant and of just how much use we do not know, but we know that the full-grown eels have cloudy eyes, though in the young the eyes are clear."

The Physicist pauses to isolate more completely that



first fifth by placing around it a pencilled oval, and repeats, "Here is all the biological equipment a creature needs to live by."

Of what use then are the four fifths beyond that all-comprising first?

"All of that four fifths, lying the length of the spinal column, is electrical tissue, attendant nerves and muscle."

This statement makes the people gasp.

Why so amazing, though?

That much of our own original endowment is used for self-preservation. The difference is that practically all of ours resides within the brain. The puraqué's equipment by which he lives takes up more obvious space. When an enemy approaches, the four fifths is called into action. From the "batteries" comes an electrical discharge which

is instantly transmitted through the water and any fish or animal within that range becomes paralyzed. Simple then for the *puraqué* to escape. If food is needed the same method is employed and the victim eaten. While the *puraqué* will release his discharge at any disturbance in the water, and thereby any trespasser into his realm is liable to shock, his food, as far as we know, consists solely of fish, and these of a size which can be swallowed whole. If a fish is shocked only, he has a good chance of reviving in time, and being no worse for the experience.

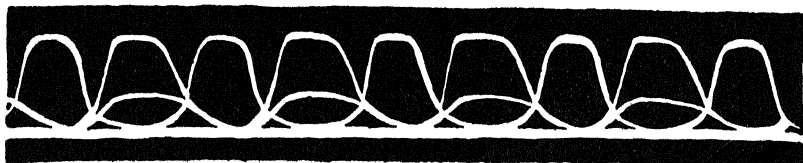
As examples of the power of the electric eel accumulate, a picture emerges of a creature apparently invulnerable. We see him, in large numbers, inhabiting the back waters of the Amazon, exerting a force which gives him indisputable supremacy over man, beasts, and fishes. It is of rare occasion that an electric eel has been found mutilated while among the other *Gymnotid* eels of tropical America mutilation and the attendant regeneration are of general occurrence.

By accident he may be trapped in a pool which dries up with the receding waters when the dry season comes upon the tropics. It is to be expected, that, deprived of moisture, he will die. What is not expected though is that he will die even quicker if he is kept submerged. Caught in a tangle of branches and water grasses he will last no more than half an hour; each four minutes, approximately, he must rise to the surface to gulp in sufficient air with his large mouth to compensate for the imperfectly functioning gills. Death on dry land comes more slowly, he can resist it several hours. Among all creatures having contact with the *puraqué* we know of at least one which is im-

pervious to his shock. At the New York Aquarium it has been observed that parasites, smaller than a child's fingernail, can push their insidious mouths into his skin, anchoring themselves there so firmly that the eel cannot dislodge them. Leeches can apparently take up an existence so satisfactory to the species that they form thriving colonies. It is reported that, "More than 2,375 parasites were removed from one eel measuring $24\frac{1}{2}$ inches in length. These leeches are the common *Placobdella parasitica* (Say) which are usually found on the soft parts of turtles, but which also have been reported on other fishes. When bearing eggs or young, the leeches often leave the host for a time and lead a free life underneath stones, and feed on worms and larvæ. It is definitely known that the eels were discharging at the time the parasites were present."

This is one of those curious contradictions with which nature continually spoils our first guesses. It is upsetting that the unbelievably small can trespass into regions where the fierce dwellers of tropical waters which are feared by man dare not venture. We wonder how the leech has this resistance.

The Physicist believes that this is an example of underdevelopment having the advantage. The anatomy of the leech may be too simple to experience an electrical shock, so that by this immunity he is more powerful than man himself. And men, from the Indians living near him before white men came, to explorers of today, are poorly equipped in both knowledge and material to handle the puraqué. To the scientist he presents a challenge, he offers possibilities of discovering truths, which may have effect far beyond the waters of the Amazon.



5. NAMES FOR IT

THE FIRST scientific use to which the puraqué was put was by the aborigines themselves. With no knowledge of electricity, they were of the first humans in all the world to find it in a palpable form, and although the Egyptians are credited with the earliest observation of electric fish (the electric catfish of the Nile), the South American Indians made the first known use of this power. From what accidents and apparent recoveries they deduced that the shock was of probable value as a curative power, we do not know. But from the accounts of early settlers in South America, we learn that the natives would, not infrequently, submit themselves to the electric shock when suffering from headache, paralysis, or rheumatism, and believed that they were benefited.

There is an account by Professor George Wilson, 1860, on the employment of the electric eel, *Gymnotus electricus*, as a medical shock machine, by the natives of Surinam. He says that in Surinam the owners of the estates always kept two or three of these eels in tanks for the use of the Negroes and Indians, who have faith in the power of the shock to cure them. "They combine administration of the shock, which they know how to vary in strength,

with applications to the ailing parts of the fat of the boa constrictor, but they ascribe the cure to the shocks." He further wrote of an English physician, who, working in British Guiana, used electric eels for the same purpose, and considered them of value. He ends his report by saying that *Gymnotus electricus* has been employed as a therapeutic electric machine "from time immemorable to the present day."

Now that man's knowledge has made it possible for him actually to have electric power within his own control, medicine is experimenting with it in a form not altogether unlike that of those primitives who "from time immemorable" tried their cures.

Certain kinds of paralysis can be cured by the use of electricity to stimulate muscle action, and the modern experimenter looks forward to the time when it will be used in remedial forms not now envisaged. Few of them, however, look back to the time when this primitive people had made the initial discovery. Just here is where we began to wonder about the stories we had read of the imagined cures in the eating of the flesh of the puraqué. The Brazilians shrugged their shoulders when we pushed the question to find if there were proof of benefit. The foreigners were emphatically skeptical; no more than a superstition they assured us. We realized then what had happened. The Brazilians were no longer primitives, the foreigners were not scientists, and somewhere the original idea of using the discharge of the electric eel for therapeutic purposes had been lost.

We are always hearing of "lost arts." The knowledge of how a particular pottery was made or a certain glaze

attained has disappeared. No one can reproduce a Stradivarius. The laying on of hands is fruitless. Then an archeologist will uncover a skull, judge it to be over 2000 years old, turn it over to a modern physician who will be amazed at the skillfully cut hole in the cranium. It is almost unbelievable that trepanning was known by "savages." Their descendants have forgotten.

There will never be another temple raised to Quetzalcoatl, or a Pyramid built according to the stars. The races of the earth will move across its face, achieving and forgetting. Something will be rediscovered a thousand years hence with the shock of birth, and that other mortal will tremble with the pain of creation as the one is doing now. And there are times when a sudden dramatic discovery will echo around the world, and we will wonder at this genius who first saw it. Time and again, though, he will have but lit the fuse, set painstakingly by many men. Perhaps no little thing is ever lost.

When the layman inquires of the scientist just what he expects the research to prove, he may get a fairly definite answer built upon theory. He will also be told that there is the chance of the unexpected occurring and the theory thereby being disproved. The principle of uncertainty cannot be ignored even while the work progresses along the path toward which other findings point. Biological life in its higher forms cannot as a rule reproduce without an interchange, and in no less manner are our esthetic and intellectual creations dependent upon the contributions of other men.

We search the bibliography on the electric eel. The earliest date we find a printed record is 1666. It comes

from a Frenchman, Richer, making astronomical and physical observations on the island of Cayenne, off French Guiana. He has no name for this phenomenon, but calls it a fish which looks like an eel three or four feet long and is as large as a person's leg. He tells of a faintness which is produced in any one who touches this fish, and that other fish are put to sleep by this same strange power. That is all.

A far more dramatic account comes a little later in a novel by Mrs. A. Behn, "the first woman to earn her living by her pen," published in 1688 in London. We do not know where she secured her information as it is believed that she never visited Surinam. It is possible she may have seen Richer's account or heard of it from contemporaries. Her novel entitled *Oroonoko; or the Royal Slave. A true History*—is an account of the life of an African prince who was taken as slave by the English to Surinam. Among his many exploits she recounts the following:

"At other times he would go a Fishing; discoursing on that Diversion, he found we had in that Country a very strange Fish, call'd a *Numb-Eel* (an *Eel* of which I have eaten) that while it is alive, it has a Quality so cold, that those who are Angling, though with a Line of ever so great a length, with a Rod at the end of it, it shall, in the same minute the Bait is touch'd by this *Eel*, seize him or her that holds the Rod with a numbness, that shall deprive 'em of Sense for a while; and some have fallen into the Water, and others drop'd, as dead, on the Banks of the Rivers where they stood, as soon as this Fish touches the Bait. *Cæsar* us'd to laugh at this, and believ'd it impossible a Man could lose his Force at the touch of a Fish; and

could not understand that Philosophy, that a cold Quality should be of that nature; however, he had a great Curiosity to try whether it would have the same effect on him it had on others, and often try'd, but in vain. At last, the sought-for Fish came to the Bait, as he stood angling on the Bank; and instead of throwing away the Rod, or giving it a sudden twitch out of the Water, whereby he might have caught both the *Eel*, and have dismiss'd the Rod, before it could have too much power over him; for Experiment-sake, he grasp'd it but the harder, and fainting fell into the River; and being still possess'd of the Rod, the Tide carry'd him, senseless as he was, a great way, till an *Indian Boat* took him up; and perceiv'd, when they touch'd him, a Numbness seize them, and by that knew the Rod was in his hand; which with a Paddle, (that is, a short Oar) they struck away, and snatcht it into the Boat, *Eel* and all. If *Cæsar* was almost dead, with the effect of this Fish, he was more so with that of the Water, where he had remain'd the space of going a League, and they found they had much ado to bring him back to Life; but at last they did, and brought him home, where he was in a few hours well recover'd and refresh'd, and not a little asham'd to find he should be overcome by an *Eel*, and that all the People, who heard his Defiance, would laugh at him. But we chear'd him up; and he being convince'd, we had the *Eel* at Supper, which was a quarter of an Ell about, and most delicate Meat; and was of the more value, since it cost so dear as almost the Life of so gallant a Man."

Exactly one hundred years after Richer's account in 1766, an English doctor, writing from Guiana to his

brother in England, gives a full description of the appearance and behavior of the *puraqué*. He called it "the Torporific Fish, till it is distinguished by a more proper name." A few years later this letter was published in "An Essay on the Natural History of Guiana, . . . In several letters from a Gentleman of the Medical Faculty." This gentleman would not at first sign his name to this publication, but on being persuaded to do so by friends apologizes in a preface with so rare a modesty, it is worthy of quotation.

The author "subscribes his name to the Dedication; not with a presumptuous expectation of acquiring Honour from the Work but solely to add to its credibility." The name was Edward Bancroft.

Doctor Bancroft not only describes the length, color, and shape of the "Torporific Fish," but invests him with a personality, the discernment of which requires great subtlety of observation. He says that, "on the back part of the head are two small fins, one on each side, which like the ears of an horse, are either elevated or depressed, as the Fish is pleased or displeased." He notes his rising to the surface every four or five minutes for air and goes on to say, "But the most curious property of the Torporific Eel is that when it is touched by the naked hand, or by a rod of iron, gold, silver, copper, etc. held in the hand, or by a stick of some particular kind of heavy American wood, it communicated a shock resembling that of electricity, which is commonly so violent that but few are willing to suffer it a second time." He then enters into a refutation of a theory expressed by M. de Reaumur in a paper to the Royal Academy of Sciences at Paris in 1714

on the Torpedo. Reaumur "undertook to demonstrate that the shock of the Torpedo was the effect of a stroke given with great quickness to the limb that touched it, by muscles of a peculiar structure. To this hypothesis all Europe have yielded an implicit assent." But if the Torpedo is like the Torporific Eel "the whole of M. de Reaumur's pretended discovery is a perfect non-entity. You may perhaps think it an act of presumption in me to dispute the authority of a man, whose literary merit is so universally acknowledged, but I am convinced that an implicit faith in whatever is honoured with the sanction of a great name has proved a fruitful source of error in Philosophical researches; and whilst I have sense and faculties of my own, am resolved to use them with that freedom for which they are given." He uses these faculties to prove that the shock is not the immediate effect of muscular motion but "is produced by an emission of torporific, or electric particles, . . ." and "that they are equally emitted from every part of the body." Among the statements listed as proof are two, of which the first is strangely inaccurate, that "this eel when enraged, upon elevating its head just above the surface of the water, if the hand of a person is within five or six inches therefrom, frequently communicates an unexpected shock without being touched." The second is a marvel of ambiguity in its bearing on the electric power of the eel. It is very simple, it states only, "The Eel is eat by the Indians when dead"!

A few years later a M. Bajon writes a "memoire sur un Poisson a commotion électrique, connu a Cayenne sous le nom de l'anquille tremblante." The most colorful item

in this paper is the description of the behavior of a cat and dog, each of which was shocked by an eel lying on the ground. The cat leaped upon it as she might a mouse but recoiled with the rapidity of a released spring and fled shrieking. Next the dog appeared, and, being of a gentler turn, proceeded to lick the eel, when he in turn leaped into the air with "des cris horribles." He observes that neither could be persuaded to return to the eel!

There are two other letters of this time dealing with the electric eel. One from Alexander Garden, M.D., Charles Town, South Carolina, to John Ellis, England. Five eels have been brought into port by a seafaring man and Doctor Garden writes, "This fish hath the amazing power of giving so sudden and so violent a shock to any person that touches it, that there is, I think, an absolute impossibility of ever examining accurately a living specimen." He calculates that one eel is three feet eight inches, but was told that "some of them have been seen in Surinam River upwards of twenty feet long, whose stroke or shock proved instant death to any person that unluckily received it." Certainly Doctor Garden was much impressed.

The other letter was from Hugh Williamson at Philadelphia to John Walsh, "the first discoverer of animal electricity." The aborigines are, of course, forgotten, they had no name for it. Williamson contributes the information that if a silk handkerchief is wrapped about the hand and the eel is then touched, there is no sensation of shock. (I wonder if Doctor Garden ever had the comfort of hearing this.) He then speculates that "perhaps fire emitted by eels lately taken, might be rendered visible." Mr. Walsh pursued this idea with the most startling success.

It is stated by Le Roy that "M. Walsh leur fit voir tre distinctement l'étincelle électrique dans l'instant on le pois son donnoit son coup. . . ."

Not until 1774-75 do we have definite scientific findings on the electric eel. He is now classed as *Gymnotus electricus*, and this being the time when the discovery of electric forces is agitating the scientific world, he takes on a new importance. The great Scotch surgeon and naturalist, John Hunter, dissects a specimen at the request of Mr. Walsh.

Hunter is amazed at what he finds, the fish consists of two parts, "a common animal part, and the peculiar organ." In the "peculiar organ" he finds two pairs of organs, one pair is called "the large organs," the other afterwards becomes "Hunter's organs" by which it is now known. But Hunter did not observe quite closely enough.

Another hundred years went by. A young German Carl Sachs, working with the scientist, Du Bois-Reymond was more careful in dissecting the "peculiar" organ and found that a portion of what Hunter called the large organs was of a different texture. This section was small and well down toward the tail. In reality it was a third set of organs. Sachs became so interested in the electric eel that he went to the Guianas to study them, there collecting much data for further work in Germany. This work he did not live to do, for shortly after his return from Guiana he fell into a crevasse while on a climbing trip in the Alps, and so met that death which had let him go free in the "dangerous" tropics. His final research was published posthumously, in 1881, carrying with it to posterity, which might otherwise have forgotten his existence, the

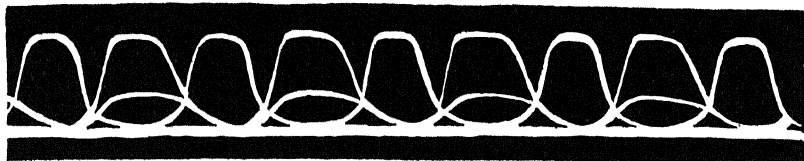
name of the third pair of organs, "bundles of Sachs."

Among the first physicists to experiment at length with the electric eel was Michael Faraday. He wrote in 1838, "Wonderful as are the laws and phenomena of electricity when made evident to us in inorganic or dead matter, their interest can bear scarcely any comparison with that which attaches to the same force when connected with the nervous system and with life. . . ." He became convinced that the discharge of *Gymnotus* was of the same property as the electricity of the Leyden jar and the Voltaic pile.

With the advance of electrical technique others resume the observations. In Germany Eilenfeld measured the discharge with a string galvanometer, an electric meter quickly recording though barely quick enough to show the rapid rise of voltage. At the Aquarium in New York Christopher Coates used a network of electrical resistances and minute neon lamps from the laboratories of the General Electric Company.

With the summary of these findings the Physicist pursues his theory of the relation between the three pairs of organs of *Electrophorus electricus* (Linnaeus) and the different curves of the discharge.

And this discharge? The Physicist may describe in terms electrical, that it happens thus—using words like discharge, cell and battery. But when he has finished you know no more of the prime cause than you do of Life when the careful biologist gets through describing blood-stream, respiration, tissue. . . .



6. LOOK AS A PAINTER

EVEN THOUGH most of my time is spent in the laboratory, I cannot move through this city unaware of it as material for a painter. The streets are full of color and the shadows of the mango trees are bright with the yellow, rose and azure of the tiled and painted houses. The colors shine and the calligraphy of wrought-iron tracery fills the arched windows and sprawls in flowing line across the wide, tall doorways. The simplicity of straight line of the houses and abundance of window space are inherited from Spain and Portugal, but they are remarkably in accord with the most revolutionary of modern architecture. Here a Corbusier would not seem out of place. The business section and the two main thoroughfares of the residential section are alive and noisy with automobiles and squeaking tram cars, but cross over into any bystreet and you are embraced by the lethargic, heavy scented stillness of a hot land where people live too close together, and where at times there is only a thin line between man, beast and vegetation. Together they drowse harmoniously in the enervating heat.

As the city straggles into the close-pressing jungle, the houses become more primitive, tile and plaster give way

to mud and boards, finally to palm roofed and sided huts squatting upon the undrained land. Vegetation crowds close upon the dwellings, and thick mosquitoes.

Through one of these sections a new road runs to the Condor Airport. Road made of earth, and here at last is red, and flaming. When the rain comes down, as it nearly always does, the puddles are a dancing Venetian red. The red spatters upon the cars and sticks upon the shoes and between the toes of the pedestrians along the way. Every Sunday afternoon in spite of rain the road is lined with people going to see the plane come in from Manáos. Mostly native workers dressed in their best, pale faded garments, often ragged but nearly always clean. Children run along quite naked, the earth browns and blacks of their small bodies are agitated bits of darkness moving against the bright red of the road.

My eyes become saturated with this color—to the point of exhaustion. I cannot step from the grayness of New York winter into the glaring light of the equator in a moment. A little time is needed to clear the mind of that other living. Yet I must try with pencil, paper, paints and canvas to gather in half this world of color, unaccustomed life.

The actual pigment used in the painting of the houses, color which could satisfactorily withstand the strong sun and furious rains, and yet carry a mat surface, would be interesting to work with. I found that it was sold at hardware stores, and so I went to purchase at one near the Gardens. The pigment was dry, ground to a fine powder, and of extraordinary intensity. To one who had always bought paint in tubes, glimpsing only a circle of color a



sixteenth of an inch in diameter, the lavishness of this display—twenty uncovered barrels!—was bewildering. I motioned to the store man that I wanted some from every barrel. He plunged his wooden scoop into the one nearest him and lifted out several pounds of rich vermilion and was about to pour it into a bag when I stopped him. I went across to where the bags were hung and took down a very small one, which would hold a cupful, and gave it to him. He looked incredulous but complied, letting the pigment slide from his scoop again into the barrel, and then with difficulty filling the little bag.

I wished that I could tell him that this was not for the painting of a house, but for a few square feet of canvas. That it was with dry pigment such as this, mixed with egg, that the Italian masters had painted their unfading holy pictures. I think he would have liked to know it. Even though I could not tell him, he filled the bags carefully for me, solemnly computed the small cost, and watched me leave, no doubt still wondering what I was to do with such a little bit of paint.

I carry the paint back to the hotel, and sit, for hours, before our bedroom window, looking out, trying to simplify the scene enough to put one single statement on my paper. Descriptive words arise instead, "riotous red, rippling roofs." Stupidity of words, but the color and form of these roofs make them inevitable. Half the city of mud or plaster houses stretches between our window and the river. Their roofs are almost continuous except where the streets cut through, and all of curved red tiles. The tiny gardens of each house are only large enough to carry single trees or small ones; the masses of green are confined to

the avenues and public squares, and as the windows on this side of the hotel look upon the old part of the city, these are few.

Up from the city come unfamiliar sounds, or rather sounds which belong to country places, hardly to a city of 300,000 population. I find it disconcerting to hear cocks crowing day and night, the cries of guinea fowls at evening, and turkeys gobbling hysterically at dawn. Then I am told that since there is no refrigeration here for meats, each day's dinner is "on the hoof" until the required moment.

I stop midway in a canvas to consider. A painting carries sound as well as color and movement—how then shall I paint a tropical city producing a country sound? I shall abstract it—there shall be the color of bright houses, patterns of arched doorways, scrolled balconies, scratched palm trees, and over and over, the red scallops of the tiles. For country sounds? A hieroglyph of interlacing ellipses, V-shapes, horizontal lines—and piercing the whole, a diagonal line of white, diminishing as it mounts to a sharp point, suddenly disappearing—the cicada.

"Ah, but Santa Maria de Belém is no abstraction," I tell myself. Nor did it come about to dazzle the eyes of any painter. It grew slowly with the life of many peoples, who on this continent were building a new civilization. They brought with them the memory of villages nestling in the hills along the Mediterranean, France, Spain, and Portugal. They took this flat land—they fought the jungle, the Indians, they fought each other, they died of yellow fever, typhoid, paratyphoid and endemic malaria and hookworm. Belém did not come about with a steady

growth, and its periods of progress and depression may be drawn by curves sharply mounting and descending.

The first structure of consequence the city boasted was its fort, and soon beside it, walls actually united to make the square, rose the cathedral. They stand now both somewhat worn with the years, but still symbolic of the Church and the Sword which made and even now rule the land. Of recent years it seems the Sword is gaining, though one could not say, looking at its history, that there was ever peace. The people were at the mercy of the government, and each party had power only so long as it could by force maintain it.

In 1867 a sudden upswEEPing curve appears in its line of growth, for at this date the Amazon was opened to foreign trade. New houses were built of more ambitious proportions, hotels, and an opera house. This last is across from the Grande Hotel, white columns standing out against the frescoed pink and yellow walls, beautiful, but the wrought-iron gates are closed now. They open only occasionally to provide audience for some passing virtuoso whose fame in the greater world is dwindling, or for one young enough to still be in the try. The peak of the curve of growth was reached from 1900 to 1912—the rubber boom. The quiet port had become transformed into one of rushing commerce. Docks were built on modern lines, money poured in as the great balls of rubber rolled out—but Englishmen found that seeds smuggled from Brazil into the Indies would bear as well and labor be easier to get. This brought about a long quiet to the Amazonian trade, and Santa Maria de Belém has slipped back again to a slower tempo.

Here no one hurries, unless he has an automobile or a motorcycle with which to startle the populace. I can leave the hotel, and my efforts to embody Pará in one small canvas, and by tram car arrive at the Gardens in five minutes. The guard at the gate sits idly in his little house, he gives me a casual "Boa Tarde" and lets me pass.

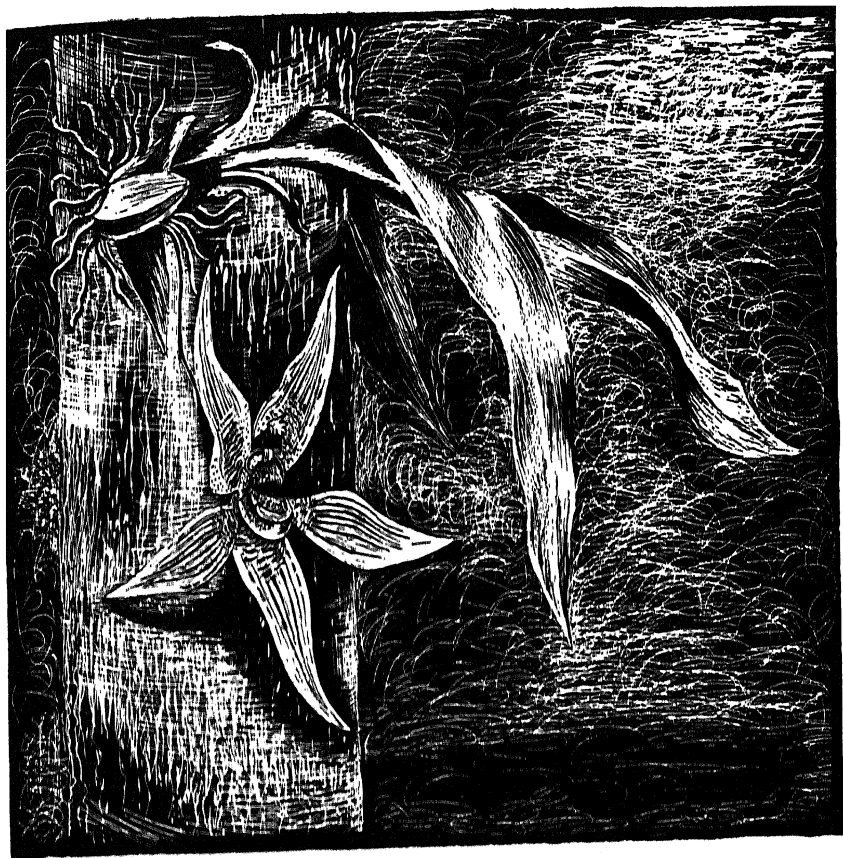
While the Scientists devise new experiments and make changes in the apparatus at which I cannot help, I walk about the Gardens to observe—here a Suma-uma, greatest of all trees, 150 feet tall, no uncertain line of beauty, from the downward-moving root formation, compact and as regular as though molded in cement, up straight trunk to the myriad of spreading branches, each twig carrying its rosette of pointed leaves; there, the walking tree, long earth-seeking roots, putting out from the leaning trunk, catching hold at length, old roots farther down releasing, thus slow movement of the tree from year to year; palms in abundance, and bamboo, its pointed delicate leaves trembling in the least wind; acacia, too, leaves sensitive to the slightest touch and closing swiftly upon contact; coffee, full of purple seed berries, and rubber trees, for show and not utility, grow straight and smooth, with no scars upon their white bark.

In this hot damp land the trees carry a host of parasites; gray and white lichens cling to them, and spongy mosses. Ferns and small cacti find lodging in the branch forks, and sometimes, high up, the most desired of all flowers, the orchid.

At times the gardener would bring some from his collection for me to draw. He did not present them to me in a box wrapped carefully in green paper, nor had they the

startling, decadent beauty arrived at by our horticulturists. This kind did not have sufficient allure to be cut from their roots to be broken and turned brown by the heat of some woman's body. They were small and pale in color, and the gardener brought them to me on a cutting of tree branch to which the bulb had been strapped until the roots took hold as they had done on the original tree where they had first sprouted. But, I'm sure, no florist's messenger could have presented offerings with the pride and pleasure of this man. He came as quietly as did all the workers in the Gardens and I would turn to see him standing in the doorway of the laboratory, holding his bit of wood with its delicate blossom. It was always a new one, one which had just opened, and there was a rewarded look in the man's eyes, as though this were an event which he had awaited momentarily. I always suspected that he had sat up all night so as to be there when the bud unfurled.

I would hang the orchid against the side of one of our large windows, and smooth my pencil to its sharpest point in preparation for recording the sensitive line and subtle shading of the blossom. There was upon me an obligation to make a drawing worthy of the gardener. A botanist would not have thought my drawing perfect but I was more concerned with finding in that flower the thing which could make a man's eyes shine as had the gardener's. Now and then I would be startled by a sudden zoom . . . and a bee would swoop around the corner of the window, push its sharp insinuating legs and heavy body into the center of the orchid. A moment of silence would follow as the bee gratified its hunger, and then it would with-



draw and fly out on noisy wings to seek nectar from another source. After one of these assaults my orchid was always disarranged, the delicate line had altered according to my drawing, and I was directly indignant with that bee. He was the means of fecundity I knew, necessary to the plant for the purpose of reproduction, but when he had left I felt as though the orchid had been violated.

Word spread quickly about the Gardens that I wanted things to draw, and there was scarcely a day when some flower, beast, or insect was not brought me. One morning I was shyly offered a small toad by an extremely ancient little man. The hind legs of the toad broadened into a base from which the body diminished quickly into a smooth-pointed head. It rested in the palm of one of the little man's hands, imprisoned by the fingers of the other hand which was only lifted enough for me to see within. The hands were so old, so brown and twisted, and the small toad, so green and fresh between them, that it looked as though it might be hiding within a hollow of dry roots. The broad, flat-featured Mongolian face of the man was as wrinkled as his hands, and the narrow slits of eyes were completely lost when he lowered them to check the transference of the toad from his hands to mine—small triangular greenness slipping from brown to white. For all three, a moment of suspense—slow release of the imprisoning roots, and the captive touches the moist uncertainty of hands unaccustomed to catching toads. But there—I have it, and a look from the Mongolian eyes strikes me with satisfied appraisal. The man's clothes are as old as his face and patched besides, and I know he wouldn't mind a milreis which I give him. After that I

saw him frequently sweeping the paths near our laboratory, and he always greeted me with a lift of a remnant of a hat which certainly could serve no other purpose than that with which to make a gallant gesture.

One day he advanced some conversation which I could not quite make out, but catching the word coffee, I thought he was offering to bring me coffee berries. I told him no, I already had coffee berries, I would like another



toad to keep the first one company. Pleasure went out of his face so quickly that I was startled. I felt sure that saying that I did not want coffee berries could not have been the cause. Was it so difficult to catch a toad? Surely not. Then it dawned on me—by Jove, the little man was asking me for money, he was using the identical approach made by the down-and-outs of New York, “Please, lady, I need a cup of coffee. . . .”

Later he brought me a companion for my toad, and then I put the two together, and the importer of tropical fish carried them both to New York for me, and from there sent them to the boy whom we had not been able to bring with us. The boy was in a small boarding

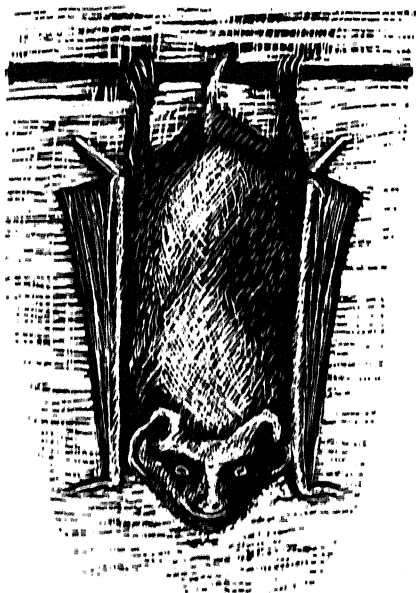
school and no adults there were interested in toads, even though they came from South America, so they were sent down to the dry cold cellar where they promptly perished. The boy wailed about it afterwards, saying "Nobody there cared anything about Science!" I have a good portrait of that small toad at any rate—for remembrance.

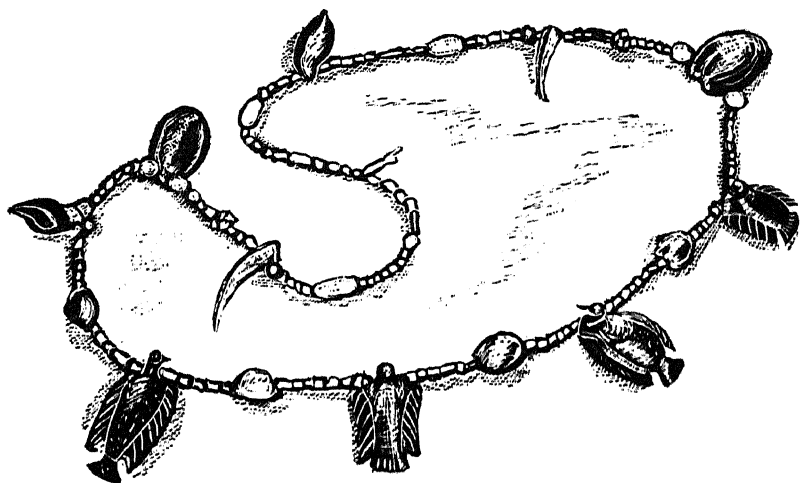
In my gallery of portraits of South Americans, I have, beside the toad, a bat. The Biologist was making collections for the Museum of Natural History and had just come in from a trip to the Bosque, a sort of wild park harboring a cave filled with bats.

He took out his specimens, now dead, and arranged them on his table for our admiration. I had only once before seen a bat closely enough to make anything of it beyond a quick sensation of movement, and at that time I had not known what I was looking at. It had been in the country where I stayed as a child, and one day as I put my hand out to open a whitewashed latticed gate between the lawn and the garden, I touched something soft and yielding, and was frightened by a quick grating sound. I looked at the place where my hand had touched and there saw a totally unfamiliar object. It was about the size of my hand and was nestled, head downward, under a section of the lattice. The body was like a piece of brown crumpled velvet and the tiny head had a long muzzle and upright ears, and strangest of all, its mouth was full of teeth, showing beneath the withdrawn upper lip. . . . It must be a little dog, I thought, though I knew perfectly well that it was not a little dog. I looked at it a long time, slipped as softly through the gate as I could so as not to disturb it further and then, childlike,

forgot it. Now I remembered suddenly that "little dog" and knew it to be a bat.

The Biologist turned these over, naming them as he went, showing the teeth of a vampire, then held one up to call my attention to it especially. "What do you think of this? A baby." I did not see a baby, but one which looked somewhat larger than the others. He told me to look closer, and then I saw beneath the abdomen of the bat, a little one, no longer than an inch. Its tiny claws were still imbedded in the mother's fur, holding it close for protection. Together they had gone into the anæsthetic bottle, a rare catch. The Biologist separated them, waxing sentimental over the relationship, while words came haltingly into my mind until I finally had it, "and bats with baby faces in the violet light. . . ." My pencil must record them.





7. OBSERVE THE PEOPLE

THE FIRST few weeks of a new city always exhaust one, but no matter, the urgency to see it all at once must be obeyed. We look, we taste, we smell—eventually we succumb and engage a car. There were no apparent traffic regulations, and the driver was convinced that the way to show a city was to unroll it for us like a fast-speed movie. I clung to the strap as we careened over the cobbled streets, wondering if this day in Belém would be our last. We left the city and went through miles of forest, road difficult and bumpy, to see the water works. We go as far as possible to where the springs bubble through the wet earth till their water is collected, carried in long ditches to the filtration plant and is then transmitted to the city.

“But the water is so brown and full of trash, how can it be

filtered?" Ah, there is a hitch, once, for five days, there was water clear, beautiful, like crystal—then no more. Again the brown and trash, sometimes little frogs. "Why?" Well, the government couldn't pay. People protested, but the government didn't listen. The government turned deaf ears to other protests too. The street cleaners want their wherewithal to live—let them eat mangoes. Yet, not long since, a certain government building had been erected in a public place. It had cost the taxpayers \$400,000, we were told.

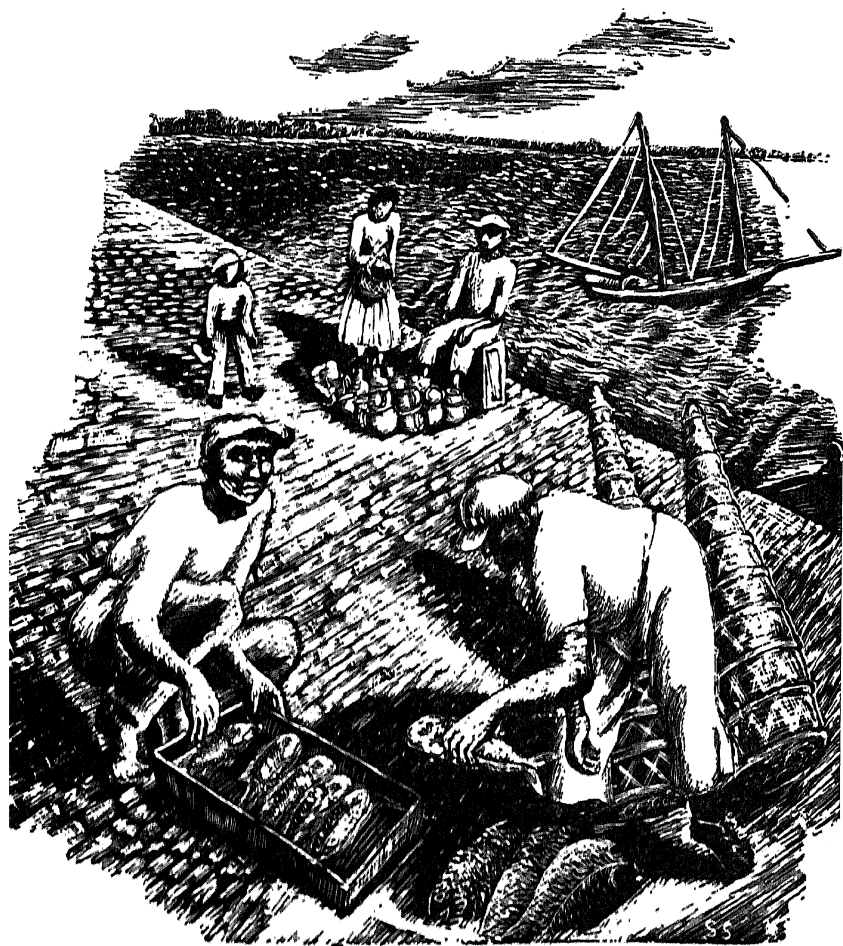
The car stops at an entertainment hall, and we get out. Here the workers take their Sunday merriment. They sit with their women and children about small tables, drinking soft drinks or beer. There is a stage of sorts at the farthest end. The curtain is withdrawn upon a cast of six naïvely decked-out girls, three as boys. They sing in high-pitched, jingling tones and dance with automatic throwings of the arms and legs. At intervals, one of the boy-girls blows a whistle for the clattering music of piano, violin and drum to cease. Then turning to the audience she makes quick, suggestive talk. No need to understand the language, one could tell that it was bawdy from the way the people laughed, and they laughed freely and all together, men, women, and their children.

For the hopeful foreigner this is the only taste of native theatre to be found, except what comes automatically with the intensity and abandon of the people during their religious festivals and at carnival time. Ordinarily he must content himself with the movies, hot from Hollywood, and snatches of the latest Broadway hits coming from Brazilian homes. Only if he will arise very early any morning and go to the great native market will he see a wide

theatre of the people's living. A theatre more colorful and fundamental than any which could be put upon a stage, for it is unaffected by tourist trade, and unvisited by any of the upper class. The Brazilian housewife who has servants does not do her own marketing; that is in the hands of her cook or house boy, and so at the market, among those who wrangle over their personal purchases, he can observe these agents also. They come with large, empty baskets and buy, with a no less critical air, but with a superiority which says plainly to the seller, "I have money and buy a great deal; therefore it is up to you to give me a good rate for my mistress." Those who buy for themselves are more anxious, and there are many who wander about the market unable to buy, but wanting this variation in their monotonous living.

By five o'clock the streets are crowded and the wide gates enclosing the market square are open, the sellers already behind their stalls for the morning's bargaining. In the near-by harbor the fishermen have hauled in their sails, and fish in profusion fill the palm-woven baskets lying upon the key beside the ships. The men bring them to the market and spill out the fish upon the counters in a rippling, undulating flow, the shining bodies slipping with that fluid movement which is the expression of the sea itself. They are clean and cool, and so newly from the water that their bright colors have not yet faded into grayness. There are shrimps and crabs, and the floors are full of strings of turtles. There are fruits and vegetables in small quantities and roots for seasonings.

There is one little corner which contains a mystery of native curios. The Portuguese in charge, who looks part



Indian, has the collector's instinct, and his jars and boxes exude the typical museum aroma—dry and inexplicable. There are teeth and bones and skins, roots, horns, beads, Indian products, all thrown anyway together.

There are necklaces of beads and tiny carvings—from the Amazon? Far Amazon, very, very far, beyond Manáos. The mind goes swiftly those thousand miles, more even, beyond Manáos. There is hardly anything beyond Manáos—but mystery: jungles, Indians, a world other than any we have ever known. But this necklace has come out of there, bearing its own history for those who know its language. Beads, old ones, unlike any manufactured now, a hundred years perhaps—missionaries, priests from Spain and Portugal. The carvings are from the jarina nut, transformed from a smooth oval into minute birds and turtles—Indians, sensitive and perceiving.

Now and then, there is a necklace carrying a small carved hand as well. This is neither Indian nor missionary, but a good-luck piece of European origin. Looking more carefully at the thread which held them together, beads, carvings, hands, one is surprised to see that it is definitely new. The beads, the tiny birds, and turtles have come down the Amazon, but the original thread upon which they were strung has long since disintegrated, and he who had eventually restrung them had not found the carved hands out of place. The incongruous whole has become a symbol of this land as it now exists.

One could be bought for ten milreis, seventy cents. The Brazilian was asking me a big price. The old woman who had been watching us shook her head suggestively at me, murmuring, “cara, cara.” It grieved her to see an ig-

norant lady done. "Ah, mas bonito," I told her, and took all that he had. I could not quite explain that I knew the wonderment that had gone into the making of those tiny carvings.

The old woman had her treasure, too. She would show it to me. From within a pocket, under several skirts (I wondered how she stood their weight in so intense a heat), she drew out a small polished horn tip, an inch long or a little over. There was a tight cap at the hollow end, and this she withdrew, to show me what was inside, a dark, grayish powder. She took a pinch of it with her fingers and, throwing her head back and to one side, inserted the powder into her nostrils. Then, sniffing delightedly, she held it out to me. I put my nose down and got the musty odor—snuff. What fun! I'll take back dozens to all the old ladies that I know in America and revive a good old custom. I bought the horns, afterwards forgetting the snuff. No matter, I'll take them to people who like the texture of smooth polished things. They can look at them for beauty, and perhaps find some use for them as well.

At the stand next to the vendor of Indian things, a man is buying a few inches of something dark, wrapped in palm leaves. It has been cut from a piece five feet long and the thickness of a thick bow. The piece is wrapped the entire length in palm and is pointed at the ends and slightly bent, like a bow again. Tobacco—black, thick and juicy. The man scrapes some of it into his palm and rolls it into a cigarette. Here no man smokes a pipe; that is left to old women and foreigners.

There are also woven baskets, native made, of palm;

sifters for farinha, and others good to look at and useful. There are gourds, plain and painted, for every household use. There are great straw hats with intricate designs in black for decoration, smaller white ones with the black hat band of straw also woven in with a bow real enough to give one cause to expect a frazzled edge before so long.

If you want to strop your razor sharp and keen, there is a smoothed and handy piece of balsa wood for this purpose; if you need a rougher surface like a file, a hard dried tongue from the arapaima fish will serve, and well, too. There are knives of every size in leather cases, and pocket-books of snake skins or lizard. The skins, dried and ready to be made up, adorn the walls, and there are soft pelts of jaguars and other wild animals. The one bit of luxury the poorer natives have is their hammocks, bright in color and five feet across. Foreigners, who have become almost native in Brazil, learn to use them instead of beds and find them preferable for comfort as well as for economy. They are here in piles higher than your head.

The center of the meat market is open to the sky, for there are no screens anywhere in all Pará except at the Marine Hospital. Along with flies and other insects come larger creatures, winged as well—vultures. They drop down to see if stray bits of meat have found their way beyond the counters.

No visitor to Pará can get the flavor of the people without knowing the native market. The shops along the upper streets which cater to the tourist trade are sterile things beside it. But go early; by noon all foods for the day have been sold, and no one buys for another day. The law prohibits sales of meat after eleven o'clock. The market

doors are closed accordingly, but the law is never more than half obeyed, and you may see strange sights at sundown along the less frequented ways. There are meat men who cater to the very poorest, and cart their stuff about in wheelbarrows; parts of beef no one else would buy, entrails, and heads with the better parts removed. The seller will stop anywhere a buyer desires and lay the meat out on the street for close inspection, cut it into sections the size desired, and hand it over—a simple process.

The streets are second only to the market place in providing to the stranger a direct outlook on the movement of the people; and of all who pass continually, none are more interesting than the porters whose quiet, shoeless tread leaves undisturbed the least leaf fallen from the thick-foliaged trees. At noon their short black shadows seem of more weight than the loosely garmented bodies which they represent in distorted outline. The porters are recruited from the most mixed in blood of the population which has, by now, produced an average man of small stature, brown skin, hair very black and usually somewhat curly—his blood is White, Indian and Negro.

The Brazilians have descriptive terms for their much mixed population. White and Indian becomes Mameluco. White and Negro, Mulatto. Indian and Negro, Cafuzo. This being insufficient, the delicate gradations between these have their designations also; Cafuzo and Indian is Curiboco. Cafuzo and Negro, Xibaro. From here the variations continue unnamed. Indians of pure blood who have become civilized are Tapuyos or Caboclos, but these are actually very rare, and though I heard the term Caboclo used fairly generally, it was usually in connection

with the cowboys and men of the more inland plains.

Just how the porters were termed I did not find out. As a part of the social world they were held in scant regard, and in this land where there were few or no automobile trucks (there were cars for luxury), only occasionally horses (except for soldiers), these porters along with their tiny patient donkeys and great white zebras became the burden carriers of the city. The laziness of tropical labor, which has become proverbial, did not belong to this class surely, for while they looked undernourished, and, being always barefoot, many must undoubtedly have had hookworm, they did not balk at the heaviest burdens.

They were past masters in the delicate art of equilibrium. They placed a ring of tight-wound cloth upon their heads and their load was centered upon this. With straight backs, heads erect, they walked the cobbled streets with perfect poise. We saw whole sets of furniture moved thus. One man could, with ease, carry a table and four or six chairs; the table first, upside down, chairs hung upon the four legs and other chairs upon the legs of these. They reached up, pyramidal, beyond the little man. It took two men to carry a piano.

The most delicate feat of portage I ever saw was that of a man who had upon his head a great tray of china dishes, and upon these a mound of electric light bulbs. He walked smoothly, unconcerned, arms hanging at his sides. It was not infrequent for a porter to stop, raise one foot from the ground, reach down a hand and scratch the habitual insect bite. The rhythm was perfect with no slight wave of unbalance.

In this country the carrying of parcels is completely reserved for the lower class. No man, who is well off enough to wear shoes and a collar and tie, ever carries the least small package; to do so is to lose caste, and for a lady to carry more than her pocketbook is unheard of. When I walked from the laboratory to the library, a distance of some twenty or thirty feet, to obtain a book, I must have a boy to accompany me for carrying back the book. My protests were useless; it was not done. The kind librarian could not understand that this made me feel inadequate. And the Physicist, with him it became a real embarrassment. Whenever he went to the near-by hardware store for supplies the boy must go too. Together they returned, the boy with the packages, the big man walking apologetically beside him. As time went on we asserted ourselves a bit, much to the horror of our Brazilian friends, and would sneak out with various things we wanted to carry. The Physicist once even carried a small basket of pottery. True, it was at night, and against the wishes of the Brazilian lady who had given us the pottery and wanted to send the maid to carry it.

There was one person in Pará, however, whose wishes we never dared protest. This was our waiter in the hotel dining room. He was called Antonio by Americans, just because it seemed to fit. No matter to him, Antonio, or Nicola, he ruled us all at mealtime. He had a special fondness for Americans who spoke no Portuguese, for knowing a few words of English made it possible for him to care for them as no other waiter could. He knew intuitively what each wanted in the way of food, and brought it. There were times when we were not allowed to see

a menu, and if we suggested that we might like certain food, which we observed was being eaten at the table next, he would wisely shake his head, wrinkling his aristocratic nose and drawing down the corners of his mouth, to express what would be our reaction if we tried it.

Antonio was a Spaniard but no length of distance could free a man when civil war was raging in his mother country. Being "of the people," we assumed he was for the Loyalists but thought it wiser, for his sake, not to ask. Even to express sympathy here was a danger. You might be branded Communist at once, and here to be one was punishable by law. Wherever his allegiance, Antonio was a gentleman of elegance and poise. Why not? Was he not the "Illustrissimo Senhor N—— P——, Presidente da Sociedade Hispaniola do Pará?"

His sense of propriety was daily affronted by the interest we took in the ancient vendor of live boa constrictors who came at lunch time to hawk his wares. But think—what an opportunity, to be able to purchase a radiant boa for sixty cents! With suppressed but continued suspense I awaited the appearance of the old man. He would step forth from the heavy shadows of the street trees, and move slowly into the bright light of the hotel terrace. The light turned his black face to a silvery purple and the brown and orange markings of the boa made for him a decorative neckpiece. He would caress the shining skin, and stretch forth as much of the eight feet as possible for the admiration of the diners; and if you had never seen a boa in the act of swallowing a live chicken, you would think this a gentle pet. This daily bit of drama never pleased Antonio, and with a superior gesture he would



wave the apologetic old man away from the open doors.

Yet he would bring butterflies and beetles for my collection, served elegantly on a plate as though they were another dinner course!

He would give us lessons in Portuguese, writing phrases for us on the backs of menus, and tactfully suggesting that we take them out to study. I availed myself of every opportunity in this direction, for each day it seemed I encountered some mild catastrophe because of my lack of the language. On one occasion so simple a thing as asking to have a dress pressed came near destroying a heretofore most amiable Pan-American relationship. The "criada de quarto" was here, according to a fairly usual custom among the small hotels in Latin countries, a man. One morning I turned over to one of the two, who took care of our floor, a dress which I wanted pressed by three o'clock that afternoon. I had been invited out to tea, and when it was time to dress, I rang to inquire for my garment. The "criada de quarto" to whom I had not given my dress arrived. I explained as best I could what was wanting. Ten minutes later he returned, bringing me a cold drink from the bar. Again I attempted an explanation. I was going out to tea, and I wanted my dress. Get the other man, the "criada de quarto" with the striped vest—he would know. I made the sign of diagonal stripes across my chest.

With a deep sound of understanding he left me. I waited interminably. He was at the door again, smiling triumphantly and holding toward me a much-battered tape measure. I looked at it helplessly but seeing the look upon his face, also, I accepted gratefully. No telling what

lengths he had been to, to find that ancient tape measure.

That evening at dinner, as I was relating my misfortune to the Physicist, Antonio, who had been listening



attentively, could not restrain himself at this point.

“Senhora! What did you do?”

“What was I to do, Antonio? I went to tea in the tape measure.”

“Meu Deus!” cried Antonio and reached for the menu to write for me “o vestido—dres.”

Not only did Antonio share our conversation, but our thoughts as well—and never withheld from us his judgment.

One luncheon our conversation was completely broken

by a wild noise coming through the doorways opening on the Avenida Nazareth. It moved toward us from a distance, tearing the air with a thumping, scraping sound which was punctuated by the sharp clang of the street-car bell. We forgot our food in an eagerness to see the cause. The din became almost unbearable, and at last, moving across the line of open doorways, came a donkey and cart, and close upon its wheels a pursuing street car. One of the two wheels of the cart had gotten in the rut of the car track and the driver could not turn the cart. The other wheel was bounding over the uneven cobbles of the street, knocking the contents of the cart into wild confusion. Metal and wood pounded against each other as the unrecognizable pieces of junk were thrown about. The driver, a small brown man, was leaning over the donkey's back, pouring exhortations into the little beast's backward flattened ears. He was responding valiantly, but his short legs and the uneven position of the cart wheels turned his efforts into an entirely unintentional motion. Instead of moving forward, the cart, driver, and donkey—all—were bouncing as though strung on a rubber band stretched between heaven and earth. Behind them continued the relentless threat of the street car.

"Ben Hur!" said the Biologist.

We relaxed into free laughter.

"Or," said the Physicist, as the din slowly faded away, "it might be called 'Progress and Poverty.'"

I looked at Antonio. What we had said meant nothing to him. He was gazing furiously at the opposite wall, a look of complete disgust upon his face. What right had that little man to endanger the dignity of the Grande Hotel!

In the cooler evenings we dined as the night began, soft lights in the square across the way falling on the mango trees, their fruits shining pale and green, trees becoming light against the dark sky, fruits brightening against the darker trees as light streamed from tall windows everywhere. Little brown children would stray up from their crowded living quarters a short way down, sent to beg from any more fortunate than they. They never said a word, stood near the doorways, their gaze wandering from one table to another, until they caught a sympathetic look. Even then they were not bold enough to enter, but waited patiently until the meal was over, to receive a cent or two.

We would watch the diners with as much interest as did these little beggars, hoping in our turn that we might learn by observation the nationality, and perhaps pursuits, of the visitors who came and went so constantly. It was not hard, for there were different ways of dressing, of moving, and handling knives and forks. If one were perchance difficult of classification, we had only to wait until the toothpick course to make certain. This last, an old Brazilian custom, we surmised. Each table was equipped from the beginning with the implements for that last course. They were really beautiful toothpicks, firm, white and well polished. The most efficient-looking I had ever seen, and there was a technique in their use in which the Brazilians excelled. The Americans and English, unless of long residence, did not know it and let the toothpicks be, no matter how the food lingered between the teeth. There were Europeans now and then who used them, but crudely and obtrusively.

With the Brazilians it was an art. The left hand was raised discreetly as a screen before the mouth and with the toothpick held firmly between the thumb and first finger of the right hand, the diner went to work. It was a serious business, requiring concentration, and this shone in the eyes, the only feature visible. I saw it once in full force at a dinner party. The guests had been laughing, joking, enjoying a rich meal, when suddenly a quiet fell upon them. I glanced toward their table, wondering, and saw the cause. It spoke silently in a dozen pairs of intent eyes, peering over upraised hands. Each guest was so absorbed in his private excavations that, for the moment, he was oblivious to the world at large!

These customs we would discuss with the Zoologist, and he, turning from us and our barrage of questions to the juicy steak, would say resignedly, "Cow, always cow." Thirty years had undoubtedly dulled his relish of both food and travellers.

The few Americans living in Pará had understanding of Brazil, but most of the United States travellers at the hotel who came to stay a few weeks' time, always on business bent, were quite willingly stupid and superior. They were here to get from the country and the people for their personal aggrandizement as much as they could legitimately, or otherwise, squeeze out. They seldom made an attempt to learn the language of the people, it was easier to talk loud and call the others fools. And their wives, when one was occasionally brave enough to leave the satisfaction of North American comfort and come down, hardly ever ventured beyond the limits of the hotel terrace. They were afraid of the sun, of bugs, of being

thought immoral if they went out alone. Among occasional exceptions were a young Jewish couple. He, an importer of Brazilian products, spoke good Portuguese, visited the people in their homes, and liked to feel that he was one of them. They came to dine with him at his hotel, and his newly married wife felt pleased, when an American, looking at her on one of these occasions, said, "See the blond Brazilian."

But there is one of the former who haunts me like a bad dream. It was obvious that she had had secure living all her days, and now was robust and well preserved at sixty. For many months she had been a martyr to her husband's successful business career. She wanted only to get away. "You'll do well," she told us cheerfully, "if you get out of Brazil alive!" and then assured us each day that we were looking paler. One day a large butterfly came into the dining room at meal time. It was new to me and I tried unsuccessfully to catch it. Our waiter tried to catch it also with his napkin, and hands about the dining room were raised. The butterfly flew up and down between the tables, and at last was captured by this woman. She brought it to me, its fragile beauty mangled beyond repair, saying triumphantly, "I put my foot on it!"

God! What phenomenon is this—a woman who catches butterflies by stepping on them?



8. THESE ARE THE WONDERS

AGAINST THIS unhappy portrait of one of my compatriots, I would like to place another, to raise a bit the level of North Americans in Pará. This one is of a man, a United States citizen, who had come down from Texas as a boy. He had worked his way from Mexico through Central America and across northern Brazil. He had had smallpox, and the dysenteries and malarias of the interior tropics, and having survived all these, he had become practically immortal. He had worked on the railroad beside the Madeira Rapids. He had seen a ship bringing four hundred workers, men who with innocence had believed the lies of recompense, go back with only forty. He by now, being practically immortal, did not fear the fevers, but

But unlike many workers who have fought their way to security, he did not want now, in turn, power to exploit. By clever cunning, which was necessary in politics to do good as well as evil, he caused a law to be passed—no timbo worker in the state of Pará could be paid less than seven milreis a day. He expected competition, and, of course, it came. Other men grinding timbo had big ideas—if they could get labor very cheaply they might make a million dollars. This law was a pain in their groins, they did not like the Texan for being clever first. No matter, the timbo workers would have their seven milreis a day. Only fifty cents at that, but with beef at five cents a pound, fish and farinha cheap, and with no complicated wardrobe in this hot world with which to be concerned, they could live.

Not so all other workers: there were the Brazil-nut workers, hundreds of them who were paid two milreis a day, or fourteen cents. Not even with mangoes growing on the streets could they have full bellies. Yet there were labor laws passed by the Brazilian government, which, a Paraense lawyer told us, were the most advanced in the world, more advanced than those of Russia. They say an employer may not lower the wages of an employee unless he first declare himself bankrupt: he cannot dismiss an employee without paying him a sum of money which is greater the longer the service. There are others guaranteeing more security. Why then is the government so afraid of labor?

As for the Texan, he could sleep unafraid, he could drink his beer in peace. That he did in plenty too. He seldom drank water or hard liquor, but always beer. Ten

bottles a day was an average, but he never felt it. He had become as immunized to the effects of beer as he was to smallpox. In his leisure moments he would sit in the bar of the Grande Hotel drinking beer and reminiscing. Often his wife was with him, a strong, blond Norwegian woman who was automatic kindness.

These two gave us much help and pleasure, too, taking us to places we should not otherwise have known about. One such trip was to an American and English "Club" some miles from the city, where a crystal spring provided drinking water and where the overflow was collected to form a swimming pool. In this land where almost all water was taboo, and all suspected unless bottled, this obvious purity was an unexpected delight. The swimming pool was made of the santo wood, great slabs forming the sides and bottom; it felt as hard and smooth as marble and the blackness of it formed a backing to the water, making of the whole a gigantic mirror. The water was almost cold, coming so continually from the deep earth that even the hot sun could not deprive it of its freshness. We sank ourselves in it with a sense of luxury almost wholly forgotten, but realizing more acutely than ever what a deprivation it was to be in the tropics, surrounded by water and yet unable to bathe in anything greater than a shower bath.

The "Club" building itself was an old earthen house, almost fallen into decay, and as yet nothing had been done to it except to build on a large veranda overlooking the swimming pool where there were tables for the picnic lunches and the cool drinks afterwards. We dressed and undressed in a room of the house on the earth floor, with

the chickens of the old Negro keeper running unceremoniously about us.

The overflow from the pool ran in a shallow ditch out toward an undergrowth which very recently had been cleared land, and beside which was a straggling path. We followed this from curiosity, unable to resist that tentative suggestive quality it embodied. Was it man or beast who travelled here? And toward what purpose did this furtive line, hardly more than a pressing down of the grasses, lead? Passing through the short growth we abruptly entered the forest, the path widening and descending slightly. The ground became moist, little pools of water lying flat and shallow and taking the same line of movement as the path. They began to run in long narrow lines as though some indentation had been made in the wet earth by mechanical means, and then I realized they were cart-wheel tracks, and looking up I saw a shimmer of wider water in the distance. But there was something different about it from any water I had ever seen, a dark lustrous red lay upon it in broken patches. I went toward it wondering, thinking some red flowers might be blooming there. But it was not flowers, it was no substance whatsoever, but sunlight falling through the high tree branches and illuminating the water. Still I did not understand, for where the sunlight fell upon the bushes or tree trunks the colors were the usual chromatics of green, gray or brown, but here upon the water there was this shining red, brilliant as a garnet, which told me at once that it was not earth color the sun was touching. What then? I ask.

"Dye woods," said the Texan.

It was a shallow quick-moving stream and the sunlight

fell straight through it, reaching the sand below and revealing every bit of evasive life within. In one spot a little school of fish moved slowly against the current, their snouts facing upstream and all their small bodies in rapid motion to so much as make progress at all. What color the fish might be I could not guess, for the brilliance of the dye drained out of them any other color and they became but an intensifying or lessening of the red. The quick movement of their bodies broke the deep well of red into a prismatic trembling, sending up through the water a hard brilliance like a stone cut sharp and angular to reflect every bit of wandering light. It looked too utterly unreal.

"But how can fish live in so strong a dye, does it not poison them or bring about some mutation?"

"Apparently not, nor does the water harm animals or humans. The natives use it for drinking water with no ill effects." The Texan pointed toward the water-filled wheel ruts of the narrow road. "They cart it out through here. The spring is privately owned, you see."

From an æsthetic viewpoint drinking garnet-colored water might be interesting, but I still felt dubious about it as a health beverage; I noticed, too, that none of the Americans or English drank it.

Butterflies were floating over the open space and resting about the edges of the garnet stream which pushed on, twisting and turning through the close-growing trees until it was lost in them, and all its way spotted with that unreal brightness.

Things happened like this one hundred miles south of the equator. One took a scraggly path, totally unprepossessing in its look, and at the end found this unexpected

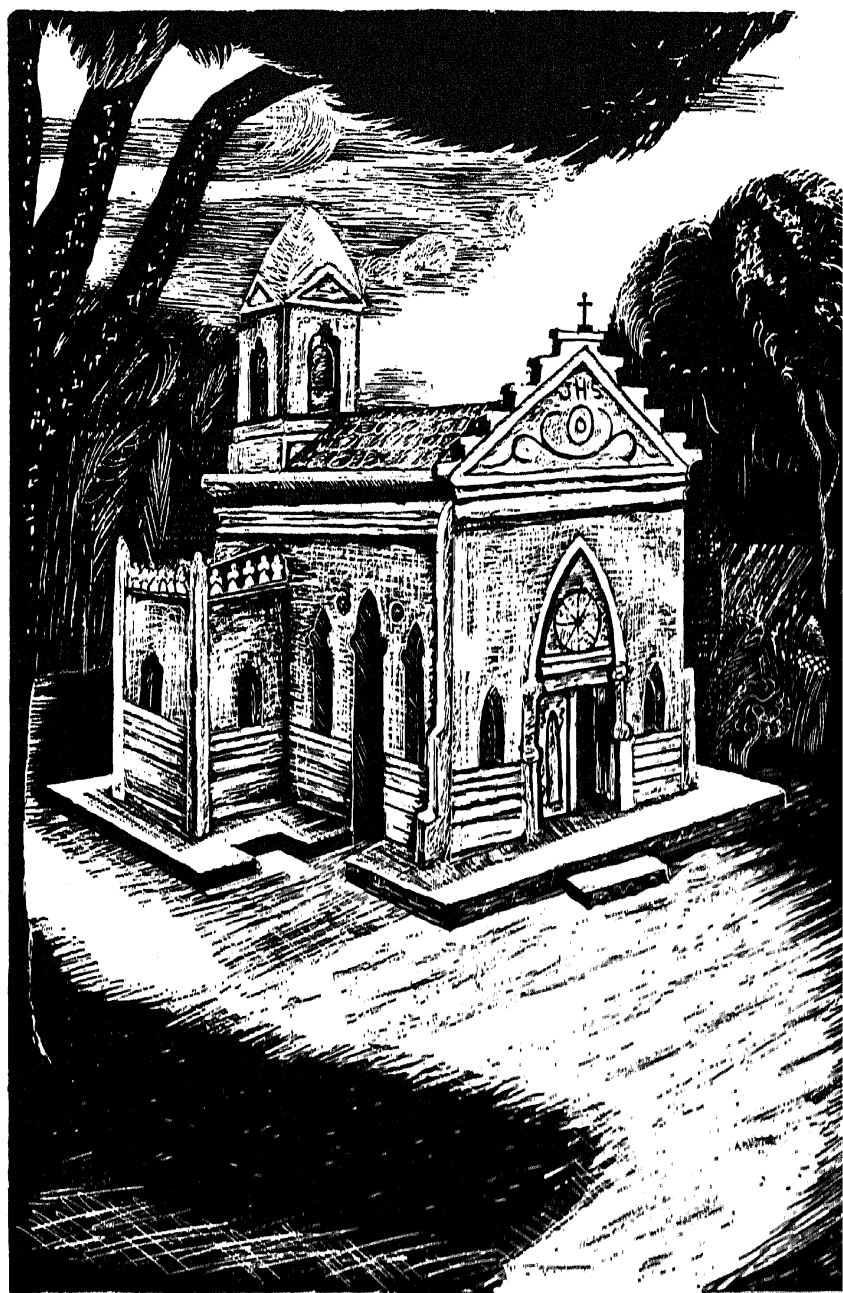
beauty. It happened continuously in nature and, at times, even man-made structures partook of it. A short while back we had gone to a little island in the Pará River and, descending from the crowded excursion boat, had taken a rickety tram car which pushed through the huddle of painted houses, and headed for the jungle. Through a green tunnel we swerved and bumped and creaked, stopping at long intervals at a single house, or at the sight of a thatched roof top, or even at nothing more compelling than a narrow path quickly lost in the tree growth. At these times passengers would dismount and when we finally reached the other side of the island there were not more than half a dozen left. These scattered in the settlement and we took the earth road toward the open ocean. Long before we could see the water we could feel the wind from it. It sucked through the avenue of trees with an unexpected coolness, blowing the skimpy dress of a child playing in the road, and ruffling the feathers of a small cock and those of his two attendant ladies, who filed behind him sedately down the center of the road. The houses straggled along the road, poorly kept and with dilapidated fences dividing them. We turned a slight angle and came upon the "square."

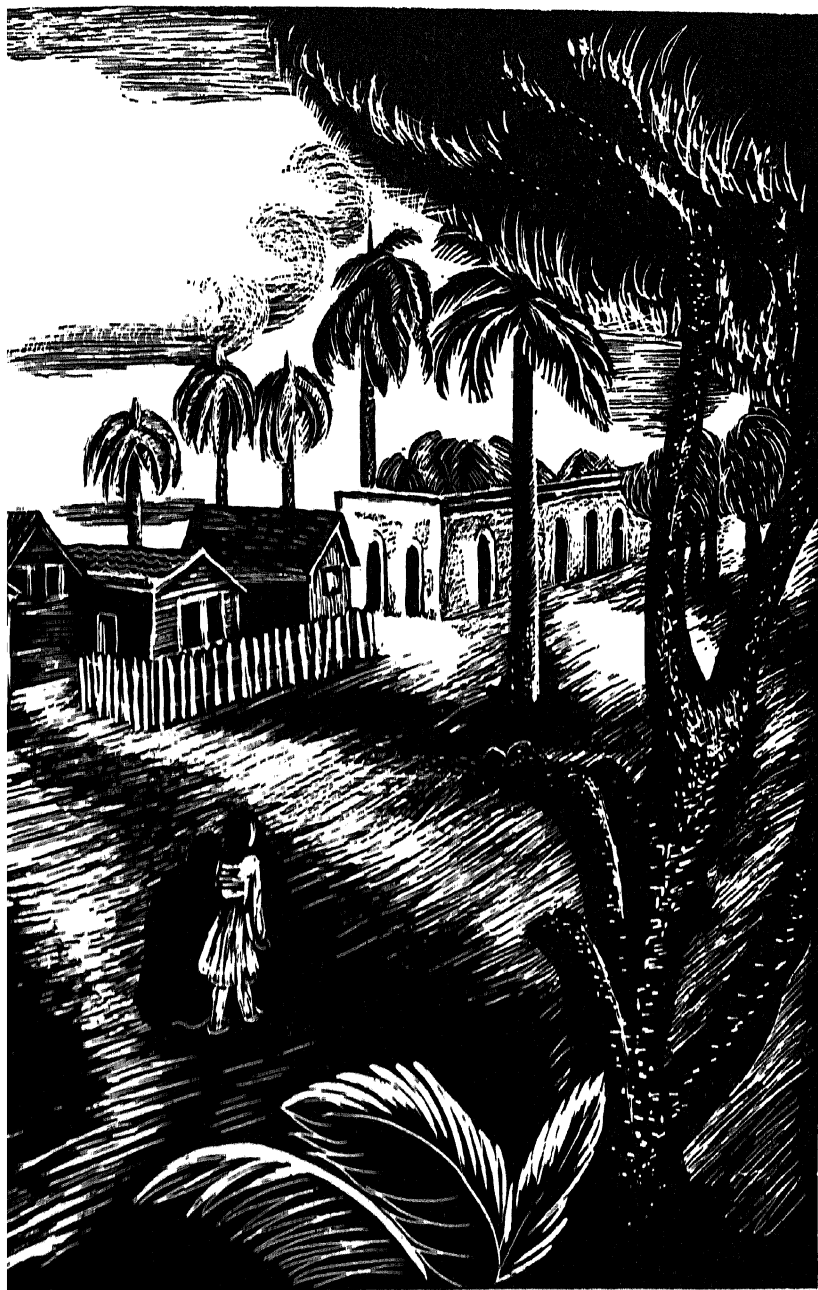
It was a small clearing only, in the center of which lay the unreality of a little church, so perfect in design, so delicately wrought, so soft in its graying white that it gave the appearance of a model for a fine cathedral. But how it came to be set down here in a clearing on this bit of an island was the mystery.

I found a shelter from the wind which now was very strong as the "square" faced the ocean on one side, and sat

down to make a drawing. The Physicist went off to explore and for about an hour I worked on uninterrupted except for the incessant blowing of the wind which insinuated itself to an upsetting degree between my paper and the board to which it was attached. No one came into the "square" for all this time and then I saw an old woman and a young girl coming toward me. They made a little detour around me and I sensed that they were coming up behind me to see what I was doing. I continued drawing until a sharp exclamation made me turn around upon them. The old woman was so close to me that when I turned I almost knocked my head against her face. And such a face! It must take a thousand years to get to look like that! It was wrinkled and twisted and battered by the wind and life, and burnt to a dry brown. Out of this shrivelled hickory shell shone two black eyes, like a pair of china pins. Somehow I was startled. The old woman paid no attention to me, but embarked upon a rapid set of remarks addressed to the drawing and the little church, looking constantly from one to the other. Her tones were high pitched and incredulous, and sounded altogether like a very much excited monkey. I held the drawing up toward the church the better for her to compare the two, which sent her into an ecstasy of gesticulation and comment. She called to the young girl, who, from shyness, had stayed some feet behind, caught hold of her and pulled her brusquely forward, insisting that she behold this wonder.

"Look! The little church! Santa Maria! She has made the little church! How?" She looked at me at last and getting closer, if that were possible, began to beat me in





the chest with her bony hand. The actual strength of that old woman was amazing, and if any force could have pulled out of me how I had made the little church, she surely would have had it! Was it possible, I wondered, that this old woman had lived a thousand years and only just now had seen a person make a drawing! It must have been so! Otherwise she could not have been in such an excitement over it. To the old woman the church was as much a part of the ordinary world as the chickens which scratched around it. It had always been there, even before her thousand years began; there was nothing wonderful about it, but that a human being could have put it on to paper taxed her every faith. It would have been as easy for me to believe that Chico the monkey had done it! I am sure that Picasso never caused greater emotion in a human soul!

But, I gesticulated to the old woman (I had such feeble Portuguese), it is the little church that is the wonder, can't you see? "Boa, boa! Beautiful!" She looked at it as though she had never seen it, and I looked with her, feeling that any moment it might be caught up into the heavens from whence it had come.

One hundred miles south equator. It must have always been so. The Frenchman Castelnau, who explored the Amazon in 1845, wrote of one such wonder—a great prehistoric Indian figure. ". . . elle semble cacher ses mamelles avec ses mains, et elle tient entre les pieds l'emblème du sexe masculin . . . la statue a été trouvée au milieu d'une forêt épaisse." ". . . in the midst of a thick forrest," a Portuguese explorer had come upon it. This statue with the significant gestures had survived all traces of the peo-

ple who made it, all knowledge of the race, a part of whose life or belief it symbolized so dramatically. For centuries it had stood there in the midst of a thick forest, unknown. Castelnau read into its symbolism a corroboration of the story Orellano told of the race of dominant females he had encountered on the Great River.

But where now are the descendants of these people? It may be that in the future other adventurers stumbling through the thick forests of the Amazon will come as unexpectedly upon further evidences of these people, creators of the great female statue who "holds between her feet the emblem of the masculine sex."

A forgotten statue in the forest, a miniature cathedral in a tumbledown village, and here this garnet stream pushing through the thick trees almost unlooked upon, are the wonders. Any turn might bring you into Heaven.

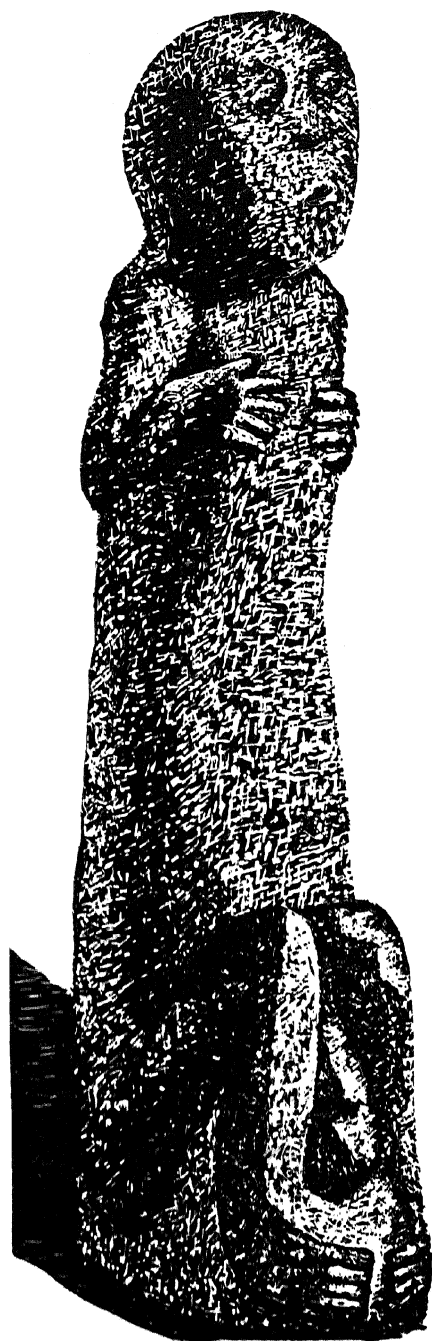
We must go back to the "club," the English ladies who do not like the forest are waiting. They apologize to us that they cannot offer us better entertainment, and food . . . even by an English method they cannot turn Brazilian products into what they would like to give us. But one of them tells me with evident satisfaction that she has at last trained a cook to make kidney pie. She forgets that I am not her compatriot, but an American, and as such loathe kidney pie!

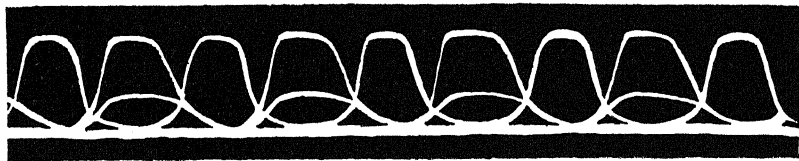
To the chatter the Texan listens or doesn't listen as he feels inclined. He knows representatives of every nation under the sun, for sooner or later they all come to Pará, and he, who is practically immortal, accepts them all. Tolerance is a long step toward immortality—or a short one toward extinction.

This drawing is made from a photograph in "L'Archéologie du Bassin de L'Amazone," by Nordenskiöld. It is described as follows, "Statue in stone. Height 1 m. 10. River Uaupés. (Musée d'Ethnographie du Trocadéro—no. 20.834.) This statue, unique in size, is carved from a block of trachytic sandstone. It represents a crouching figure, the hands pressed against the chest; the features of the face are now very worn so as to be scarcely perceptible. Discovered in the seventeenth century by Portuguese friars, near the source of the Uaupés river, it was brought to France after many adventures by Francis de Castelnau in 1847."

After considerable checking, I believe the Nordenskiöld photograph to be of the statue which Castelnau mentioned in his "Expédition de L'Amérique du Sud" Tome 5. He writes of it further in these words; ". . . a life size statue representing a human being;—the head was extended backwards like the skulls which are often found in the Peruvian tombs. Following the tradition of the country it represents an Amazon and her position can perhaps confirm this belief."

The statue obviously represents a male figure, but Castelnau might have been misled by the primitive distortion into thinking it female, or wanting support for the Orellano legend read into it the romantic symbolism pertaining to the idea of a race of Amazons.





9. THE PADRE

"HE IS THE most interesting man in Brazil," one of the officers on the English ship which had brought us to Pará had said. "Vicar of the largest parish of the Church of England in all the world—that of the Amazon Basin, and finally, an English clergyman who casts aside his cassock and chases butterflies!"

And so expectantly one night we rang a rusty, tinkling bell, and peered through a gateway into a tiny garden spotted with low light, falling slantwise from a lighted porch at the farthest end. A thin black woman answered, and said in English, "Yes, he's in," and the gate was opened wide in hospitality. We walked toward the bright light and saw beneath it, seated at a paper-strewn desk, a gray-haired, heavy little man. "Padre," said the black woman, "visitors." There was a big bustling, energetic movement, papers were thrown aside, chair pushed noisily back; our hands were shaken and we were greeted in the best of Oxford English. "Sit down, sit down, and please excuse my dress. It is very warm tonight, and I was finishing the Coronation Anthem." We assured him that no excuse was necessary, thin white pajamas were by all means the sensible apparel for a night like this, if clothes

were worn at all. We sincerely wished they weren't, for ours stuck to us at every point of contact.

Our host began to entertain us with a steady flow of very varied conversation. First in his mind just now was the coming coronation so far away in mother England. Like most Englishmen we had met, he was personally very angry with ex-King Edward for loving Mrs. Simpson. And here, he, a voluntary exile for some thirty years, sat in thin pajamas, on a tropic night, composing music for a new king, five thousand miles away. It was difficult for us to understand this particular form of transferable devotion.

It was easier to understand why this alien land had so strong a hold upon him; for watching the keen quick movement of his blue eyes, half hidden beneath the screen of overhanging, bushy eyebrows, we knew it would be hard for any larva, pupa, butterfly or moth to escape its searchings. Here, too, was reason for the proportionately small and delicate hands. These fingers would handle the fragility of insects gently and dexterously, and with precision chart their every line or hue of color.

He showed us now some of these results—books printed by the Rothschild Foundation in England, beautiful reproductions, as could be attested by comparison with the originals beside them. He still had many drawings yet unpublished because of the great expense incurred for correct engraving, and his books were for collectors and museums.

He was leaving Pará soon for Pernambuco. The English Church there wished him to conduct their Lenten services, and he was not loth to go, for there he hoped to

find the yet unknown larva of a particular butterfly. Religion and science to him were one and indivisible. There he would go hunting for days, searching trees and bushes for a caterpillar of unknown size and color, and when he found it, there would be one more piece of final knowledge in the life cycle of an insect. Here the identical spark of life which had commenced in the egg laid by the fertile female butterfly would be in process of continuation toward the adult insect. In this caterpillar, that life spark, whose outward manifestation of body covering changes so often during its short existence, could be beheld in one tiny moment of metamorphosis. Soon it would enter the pupal stage and then, practically inanimate within its covering of silk or chitin, await the change that sends it forth, no longer forced to crawl ignominiously upon slow-moving legs, but equipped with wings to meet the sky. Emerging at the moment of completion, the insect, as the air hardens the veins within the wings, can raise them and with no painful process of learning how, fly straight and surely through the air.

This to the Padre, I believed, was symbolical of human living and promised resurrection.

My eyes wandered from the Padre's animated face to a small moving object upon his wall, a tiny lizard, pale yellow in color, with the eyes shining darkly in its small head. I watched it mount the wall with short quick rushes, and start across the ceiling with the same facility of movement. Another came up the opposite wall and joined the first, but this one was tailless. The Padre anticipated my question by telling me that these members of the lizard family were here called "Geckos." Some people did not

like to have them in their houses, which was very silly as they were quite harmless and very valuable in keeping down the many insects which lived in the plaster walls.

"The one without a tail? The cat—she tries to catch them, sometimes just gets the tail which comes off quite easily and seems to cause no inconvenience to the Geckos—a new one grows eventually. Pretty little things, I like them."

Mr. Henry Walter Bates of Amazonian fame felt differently. He tells you, "The Geckos are very repulsive in appearance." I had felt this comment coming from a naturalist was rather strange and preferred the Padre's sentiments.

But the Padre was not giving lessons now in Natural History; he was beginning as strange a personal story as I had ever heard.

It came about that the Padre had been travelling and was returning to Pará. No sooner had he got aboard the ship than he was called into consultation by the Captain, who solicited his aid in the case of a fellow passenger; a woman, English also, who must be dissuaded from an attempt to enter the interior. She was a woman of refinement and some wealth too, and now in her late fifties had come upon great sorrow. She had become estranged from her husband, and of her two grown sons, one had elected to stay with his father. The other, her adored, had become imbued with the missionary spirit, and, against her pleadings, had gone to save Indian souls. He was a dreamer only, and when the dysentery came, had no art against it.

The mother got news long afterwards, that a companion had buried him at such and such a place, approxi-

mately. The diary was shown as proof he was the same. The mother's agony fixed on a plan to go there, to that place, wherever it was, and find that grave. She would take up his bones from that alien soil, and then, perhaps she might have peace. The English clergyman must dissuade her from this journey of nearly certain death. Not only her life was at stake; but those who, because she could afford to pay, would take the chance.

The Padre comforted her with Christian doctrine; her son was not there under that Brazilian earth. He was in Heaven. Even if she found that grave, which was most unlikely, she would be no nearer her beloved than she was now. She must not think of his being in the earth, but in that Other Land where she would join him eventually. It was a slow process, but after some days a strange quiet seemed to fall upon the woman. She was listening at last. The Padre felt encouraged, and one morning when she did not come down for breakfast, inquired solicitously. The steward was sent to call her; perhaps she had overslept. He came back, running fast, the red gone out of his English face and a trembling about his mouth which prevented speech. Others went to see and found the woman crumpled on the floor. There was a five-pound note and a sheet of paper, explaining. The money was for the steward who must clean her blood away. She was sorry for the trouble she was giving them, but there was no other way, she had gone to join her son.

And the Padre whose room had been next to hers, had he heard nothing? He remembered now, there had been a slight noise in the night, but he had slept heavily and only half awakened. He little knew how nearly he had

come to going too. The bullet had passed through the woman's head and struck the adjoining wall, the other side his bunk, but its power being spent, had rebounded, and now lay upon the floor.

The room could not be touched until police arrived. Fortunately the ship was nearing port, and would be in by the following morning. The police observed and acknowledged suicide. How to be buried now? The Church for which her son had died could not assist. Its laws were that a suicide must meet God without the last consecrated touch. But the clergyman aboard, who had his own beliefs, was not always orthodox. He buried her without fear or regret, oblivious of his own persuasive powers.

He shook us back into the present. "Well, so it goes down here. Come now, I will play for you."

We followed him through several rooms, hung with family portraits and paintings of his own making—jungle scenes and seascapes. He was then in the midst of a composition of a storm upon the Amazon. He stopped before this canvas and discussed with us the particular movement of the foreground wave. Then seating himself at a small piano, about the pedals of which was built a boarded elevation to meet his too-short legs, he played for us his new anthem and bits of reorganized Church music.

The gate bell rang and we arose, expecting that the chauffeur had returned as we had asked, to take us back through the unfamiliar streets.

"No, no," said the Padre, "you can't go yet, you haven't had drinks even. Cook, Cook, bring us drinks!" He pattered down the walk, slippers flapping, thin pajamas pressed against his body by the air. "Come in, come

in," we heard his voice in the distance. "Why, it's my old friend. Just in time for a drink. Come in."

Cook appeared with whiskey, soda, ice, and glasses. The Padre urged us to help ourselves. He filled his own glass and returned to his recital. Placing the glass upon the top of the piano, he played an original rendering of the "Te Deum Laudamus," singing fervently his praises, and seemingly quite oblivious of our being there. Pausing a moment, he reached for his glass, and taking a good big drink, burst into the "Nunc Dimittis." It was a far more exultant tune than that to which we were accustomed, no slow-drawing out of the "Lord, now lettest thou thy servant depart in peace; according to thy word." It was gay and jubilant; thus would the Padre have felt had he seen Our Lord.

Then with the suddenness which we had already found so characteristic of him, he wheeled the stool about, and facing the Physicist shot at him, "Now these eels?"

The Physicist was ready, "These eels, . . ." Eventually they paused to mop their faces.

"Strange . . ." mused the Padre. He had heard of electric eels since he first came to South America, had seen them in the streams when he had been out collecting insects, but he had not given them much thought. "I would like to come and see you work with them."

He in turn invited us to attend services at his church. We went the following Sunday night. When we stepped out of the warm singing night of the tropical garden surrounding the little church, it seemed as though we had suddenly stepped into a bit of England or even back into one of our Episcopal churches of the United States of America.

It was built like any number I remembered—divided lengthwise by a center aisle flanked by hard long pews, a raised chancel at the end and three small Gothic windows rising behind the altar. We were shown to seats by a Negro usher and as we advanced realized that our entrance was creating some interest among the congregation. Looking discreetly about us to see what other North Americans and English were like in Pará, it became slowly but impressively evident that they were all quite black. The service proceeded in the accustomed way, though the Padre was organist and choir as well as priest. When he preached, he talked of Nature. "Stop," he cried, "worrying about your clothes, the horrid things." (No wonder, he could scarcely breathe in the heavy black cassock he was wearing.) "Go out and learn of Nature; perhaps you will come to know God too. . . ." Then he talked of Heaven—in that Place the best of man would be continued. What was right in our living here we would have a chance to continue There; and if our living had been quite right or almost so, we would have a chance to fulfill our personal desires too. . . .

I later asked some one in Pará why the services were divided between the whites and the blacks; I had nowhere else noticed such racial discrimination. At first I had not been understood; then I explained that we had gone to an evening service attended by Negroes only, so I had presumed that the morning service had been for the whites. "Oh, no!" came the answer, "that is all the congregation the Padre has. You see the whites down here are exceptionally conventional, that is, the ones who might go to church, but the Padre is a little too much for them. They have no understanding of his passionate interest in 'bugs'

and feel that to him their souls are of less importance; it hurt their ego, and so they stopped going to church. They say once when the Padre was in the midst of a sermon that a butterfly flew into the church, and the congregation was startled wide awake by the sudden stillness as the sermon came to an abrupt end. As they looked toward the chancel they saw the Padre gather up his robes, rush down the aisle and out of the door in pursuit!"

I did not believe this latter story, but I found it an enchanting picture, and as I thought of this and remembered his sermon on the gifts in Heaven, a vision of the Padre came before me—there would be a butterfly net in Heaven for him surely, and he by then, himself equipped with wings, the better to pursue celestial insects, would fly from star to star, collecting angels and little cherubs.





10. CONVERSION

TO LEARN the story of the religion of a country is a long process. But any visitor to Pará must wonder just what part the Church plays in the people's lives.

The English Captain had said the Church in this land was the best thing the people had, the only thing that held them together and kept them going. The German chauffeur, while showing us the old and new cathedrals, kept murmuring, "The people here are crazy for the Church, and the Church takes all their little moneys and sends them to Italy for holy oil paintings and windows and crucifixes." The two cathedrals were gaudily handsome, and many of the windows bore inscriptions of donations by wealthy families for posterity to read.

The "Church" here means the Roman Catholic, for although missionaries of various Protestant faiths have been in the country for the last hundred years, the mass of the people still belong to the Church of the early settlers from Spain and Portugal. Priests were sent with the first explorers; they came as part of the equipment for subduing a savage race. "To the Glory of God and in the name of His Majesty" is inscribed on every document relating to their exploits. These documents are curious examples of

the belief of the superiority of the white man, that same white man's creed, and his belief in the necessity of the conversion of the Indian.

One of these, giving power to Orellano to colonize the left bank of the Amazon, gives instructions pertaining to these matters. In part it says: * “. . . we order that they (the Indians) be given to understand how we are sending you solely to teach them and instruct them, and not to fight, but to impart to them a knowledge of God and of our Holy Catholic Faith and (to inform) them of the obedience which they owe us; and if by chance the Indians should turn out to be so haughty that, not heeding the advances and peace exhortations with which you shall have approached them, they will still come at you and attack you in a warlike fashion, you having no other means of escaping and defending yourselves against them, save by breaking with them, (then) you shall follow this latter course with the greatest amount of restraint and moderation and with the least number of fatalities and injuries to them that is possible; and all the articles of wear and also objects of adornment that you may lay hands on (and other pieces), that are not arms of offense or defense, . . . you shall have them returned to the said Indians, telling them that you wish that there had not been inflicted upon them the damage they shall have received, and it was their fault for not having been willing to believe you, . . . (and that you are seeking nothing) save a friendly understanding with them and redemption for them in the service of God and of His Majesty. . . .”

**Archives of the Indies*, 139: 1-1, translation by Heaton of “The Discovery of the Amazon,” by Jose Toribio Medina.



The history of how that "redemption and service" was brought about is a part of the inevitable agony of conquest. The Indians at the mouth of the Amazon did not want the instructions of the Spaniards; they had memory of one who had come there some time back and who had left "because the place appeared to him to be dangerous, though not until he had seized as prisoners thirty-six of the trusting islanders who dwelt on its shores." This one was a Spaniard, Pinzon, onetime pilot of Columbus, who, cruising along the northern waters of Brazil, had found the sea fresh far out from land. He had followed this fresh current and after travelling forty leagues had reached the mouth of that great river "the famed Marañon." The date was 1500. Other stories of the whites who touched upon this shore are hardly more favorable, so small wonder that by 1544 the Indians were disinclined to be "taught" by whites.

Orellano's expedition for colonizing the Amazon ended in disaster, and he perished in the undertaking. But on his first trip down the river from Peru the conversion of the Indians had been begun. During the days spent at an Indian village "Orellano took possession, in the name of the King, of a few other chiefs; had Friar Carvajal preach on the more solemn feast days; . . . all confessed their sins to the two friars of the expedition; and finally with the preparations all completed and their consciences cleared, Orellano gave orders for departure for the 24th of April."

As to just how much was understood on either side, I think could be up to question. The Indians could not have known any Spanish, or the Spaniards been particularly fluent in the Tupí, the universal language encountered

along the length of the Amazon. What actual conversion of the natives took place was postponed to some fifty years later when Jesuit priests came, not as part of an exploring expedition to conquer, but as emissaries, of the Roman Catholic Faith, to persuade. They were highly successful in this, and soon proved to be the only protectors the Indians had against the encroaching whites, and their own half brothers the Mamelucos. These latter became allied to the foreigners to such an extent that they took part in raiding parties which went into the peaceful inlands to procure slaves for the building of and maintaining the cities of the coast.

There were long years of bitter battle between the Jesuit Christians and those of every nationality which came to colonize Brazil. The laymen colonizers resented the success which the Jesuits had with the Indians, not because they were instrumental in giving them the Christianity which they could not, but because along with this they managed to convert the Indians to industry and organization as well. The Jesuit missions became rich, the Indians, within, content to work. The outsiders needed labor for their own cities, but when they used their particular form of coercion the Indians who could not escape died upon their hands. Instead of leaving the Jesuits in peace, their envy increased and they were not satisfied until the missions had been destroyed, and the priests made to flee the country. Since then no people have known the precious art of preserving the Indian and civilizing him as well.* The pure-blooded Indian of Brazil has withdrawn

*There is one notable exception to this statement: General Candido Mariano da Silva Rondon. Born in 1867, of parents of Portuguese and Indian blood who were poor farmers in the Mato Grosso, this man, by his

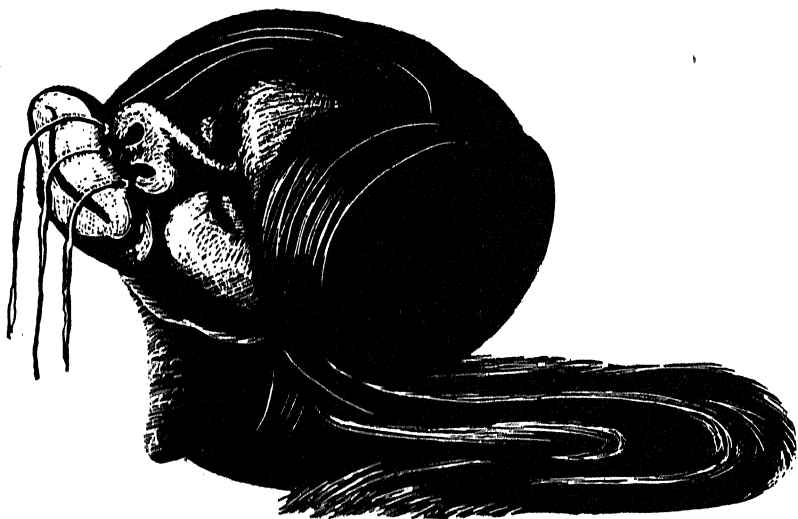
further into the interior than white man can maintain himself, and so is lost to the world as a race. Only occasional stories trickle through and in these the endings are usually disastrous. The other kind seems to be forgotten.

There is one about a Baptist missionary who came to convert the Indians. He was a man of courage and respected by the Indians with whom he had made contact. But he was not content merely to convert the friendly people; the tales of savagery further into the interior seemed to him a challenge. He would approach one of these tribes, and leave the rest to God. With two companions he started, shutting out of his consciousness the cries of horror of his followers when he told them of his intentions. He made his two companions wait at a distance from the encampment, with instructions, that if he did not return within a reasonable time, to get away as quickly as they could. At the edge of the encampment he stopped and took off his shirt. By his wearing only his trousers the Indians would realize more quickly that he was unarmed. He had learned a few words of the languages of these people, and with these as his protection, he ran suddenly into their midst. Raising his arms above

own extraordinary ability fitted himself for the unique work the accomplishment of which had been his ambition since early manhood—to open up the interior of Brazil and civilize the Indians. Under his personal direction nearly 5000 miles of telegraph lines were put through theretofore uncharted country. The wild Indian tribes of this area were approached peacefully and with remarkable success. Rondon always maintained great patience toward them; on one occasion postponing entry into a certain district, where he found the Indians particularly belligerent, for an entire year until he could negotiate a peaceful agreement. He built schools for the Indians, and in time became mediator for them with the government and even among their own conflicting groups. His work is a shining light amidst the darkness and stupidity which “civilization” has meted out to its conquered peoples.

his head, he cried, "Friend, Friend! I love, I love!" This salutation, and later the gift of a machete, conquered them. Some years later he decided to try his successful approach on another and fiercer tribe. This time he could not find even one to accompany him. He went alone and he never came back.

Always, too, in the interior, there were the head hunters—Indians who prepared the skulls of their enemies as



trophies. The method was quite simple, though tedious. They got a head, stripped the skin from the skull, sewed up the lips, and into this strange bag a heated rock was dropped. The rock was turned about inside the skin continuously and when cold replaced by another hot one. As time went on the head became smaller and smaller, and the

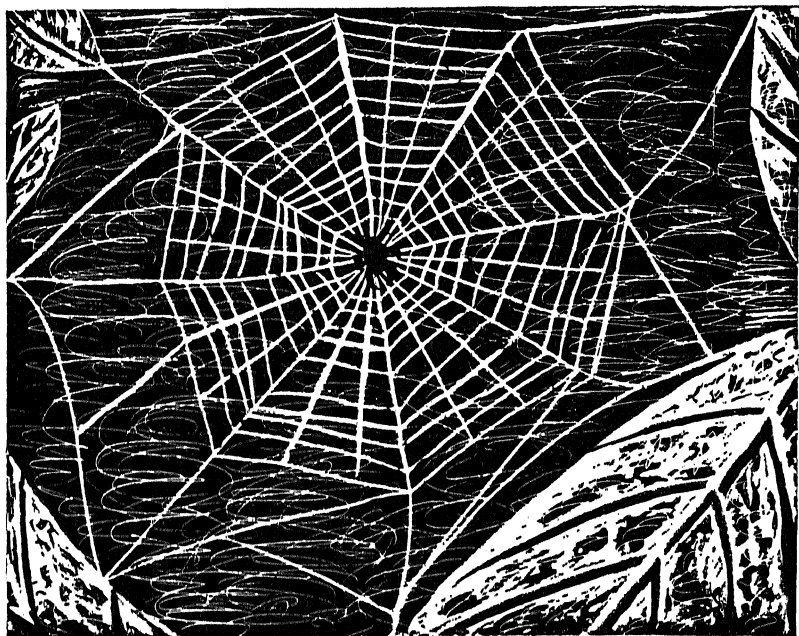
size of the rocks reduced accordingly. The process may take several weeks. When finished the head is about the size of a child's fist. But it did not end there. Whites coming in thought it interesting to collect. A demand for dried human heads arose.

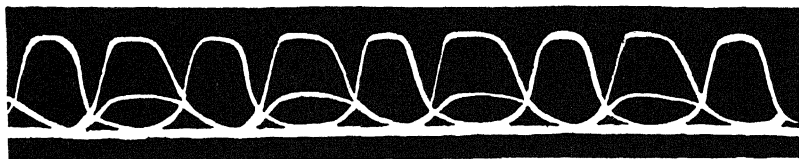
There is a story which has been told every foreigner for years with variations. Tomlinson tells it in his *Sea and the Jungle*, thus: Once there was a crusty little English sea captain. He had a little wart over his left eyebrow. He came to the Amazon and heard about the head hunters, but did not believe. He went up the Amazon to investigate. Two years later a little dried human head came down; it had a little wart over the left eyebrow. The last story was about a red-headed man; he, too, was unbelieving, and went searching the interior. A year later a little dried human head came down the Amazon; it had red hair.

As the collectors' demand increased, travellers into the interior became alarmed. Finally a stop was put to this abnormal gratification. No dried human head was allowed to leave the country; no individual to own one.

This did not open up the interior, however. There are thousands of square miles there as darkly unknown as when the first white man came expecting spices and India. There are strange extremes in the Indians themselves living there. Certain tribes are gentle, friendly; others, living perhaps only a few miles away, are fierce to a degree that none dare enter their country. And you will find fat and careful English ladies sitting in the bar of the Grande Hotel, eating a cool ice and shuddering at the mere word, Indian. They will tell you tales of how their friends have tried unsuccessfully to civilize the Indian. Civilization

here meant learning the art of being a servant without protest and acquiring due respect for their white superiors. One particular Indian girl who had thus been exposed to civilization retaliated one day by telling her horrified mistress in no uncertain tones, "I like ankle bone." The mistress was aghast; she was harboring in her house one who was at heart a cannibal. She was not psychologist enough to know that this was but a quite normal resentment against bondage. And for the Indian it is just as well that to the average white the great interior is still a closed country.





II. ALMOST VIRGIN FOREST

THE ATTORNEY GENERAL who was assisting the Zoologist in the directorship of the Museu, came with his wife one afternoon to the laboratory to talk of eels and offer hospitality to the visiting scientists.

The Attorney was a fragile little man of about forty, with a sensitive, quick mind, and he knew how to ask the really intelligent question about scientific matters outside his knowledge. We wondered how he accomplished this, inquiring if he were a scientist, to which he answered, "only amateur." But this was modesty, as we discovered later. That sensitiveness of intelligence was translated into visual form in his thin, delicate hands and their careful movements. He was olive-skinned and black-haired. The long eyes behind his thick glasses, and the silky, black mustache, gave him an oriental look.

His wife was small, too, but more sturdy and vivacious. She was dressed stylishly, in black and white, and wearing a raincoat of North American make. The Brazilians had not yet learned how to turn their raw rubber into manufactured articles, so it must go out in great evil-smelling balls, and eventually return in useful form.

We were glad to accept their invitation for tea at four

o'clock, and the Zoologist would take us. The house was on a quiet street, tall and shadowed by the mango trees. The interior was quiet, too, furniture and paintings carefully arranged for repose. We had tea in the dining room, seated in tall-backed chairs of graceful carving. That of the Attorney General rose some distance above his slight height. Beyond him, upon the wall, hung a painting of robust nudes and animals in profuse jungle setting. It was large in area, bold in form and color, almost heavy—the creation of the Attorney General. I found it hard to relate one to the other, but concluded that the visible strength in the painting was the spirit of the artist, throwing up a bulwark against his physical fragility.

He had also made a careful study of South American monkeys and had done paintings of them all, some thirty-five or so in number. He had found a new species in the process and now he hoped to find a publisher for the whole. This work was done whenever there was time left over after legal duties. His wife wrote of scientific matters, too, and made drawings. Together they had published brochures on frogs and toads. They both wanted freedom for this work and more sympathy. This was not a place where art and science flourished.

The room was filled with a sweet exotic odor which at first I did not recognize. Then memory stepping back sufficiently, a picture of Algiers came before me, Arabs, this same sweet odor. Yes, I have it. It is caught in a tiny vial of golden fluid—jasmine. But here it is not extracted. It comes from the flowers, not crushed, but still in their shining whiteness. They are dropped like bright stars upon the table, as if a gentle wind had shaken them there

from the heavy vine. I exclaim at their beauty and am urged to take them, as many as my bag will hold. The blossoms stay there, long after, until they become brown and without fragrance. But even then I do not take them out, for seeing them upon occasion, withered as they are, I recall their first loveliness and the grace of living in that house.

The following Sunday, the Attorney General, his wife, and the Zoologist take us very early in the morning to see a piece of virgin forest, or "almost" virgin, the Zoologist corrects. We go in tight riding trousers and are well washed in sulphur solution about the ankles, legs, and wrists, to be unattractive to the insects. There are specimen containers, a dip net and one for butterflies.

It is fairly cool at seven A.M. and the forest receives us with a still expectancy. We pass along a sort of path made by occasional workmen going to gather wood. This is the reason for the "almost virgin" of the Zoologist's identification. The trees, tall, and close together, have mounted with so quick a growth to the light above that it has precluded crookedness. They are almost always straight, as if some unseen hand from above had caught the young sprouts and pulled them upward in an undeviating line. The branching at the top is so heavy leafed that the strongest shafts of sun find difficulty in making entrance.

One hundred feet below, we are enveloped in a gray stillness, which increases as we go further inward. Where, I wonder, are the beasts and birds which inhabit jungle forests? Explorers tell you of them profusely, and writers find them always there. It is only Hudson, though, who has the supreme understanding of who can hear bird song



in the virgin forest. It is he, who, by some subtle means, has become part of the first earth stillness.

Men cannot expect to enter this world, talking to one another in loud tones, their heavy-booted tread travelling from the imminent crumpled leaf in the pathway to broken twig, to living vine, and bush and tree. These man-created sounds must travel through the forest with startling rapidity and foreboding, so that all animals alert to danger become mute and unmoving.

Only the insects, whose hearing is pitched within another range than ours, are regardless of our approach. The great black stinging ants move no faster up or down their tree passageway to and from the nests above. The hornets' activity of building continues unaltered, oblivious of our worded admiration of their knowledge of construction, and the gray lichen textured beauty of their hanging houses. The caterpillar's rhythmic leaf-crunch, even, is audible if you are still. But the birds and beasts and especially the snakes, where are they? The Zoologist tells us there is a way of learning both to see and hear in the forest, it is not like in the world outside. Outside the more noise we make the more we are sure to hear and see, but without discrimination. Outside, yell loud, if you want a crowd. But here, in the shadowed forest, it is different.

Here quietness and control of every measured movement are at a premium. By these means, and that of acute perception, you may learn even to know the precise moment a cassique drops her first egg in its swinging nest. But you cannot learn this in a day, or two; half a lifetime, or all of it, would not be too long.

We cover several miles of earth space this day, stop-

ping at intervals to observe intricate vine growth or flower brilliancy and noting that reds and blues are the predominating colors, white sometimes, but seldom yellow. Why?

We come upon a stream which gathers in a little pool a few feet down. Here a solitary Negro woman is leaning over to fill her gourd. She straightens and observes us with surprise, offering no greeting, but placing her gourd upon her head withdraws into the forest. No sound comes from her barefooted tread, and she moves with the dignity of carriage had only by those who, because of circumstance, must carry their burdens high upon their heads and stretch to meet them.

There is a spring a little further down where we may drink, but when we reach the place we find that it has become lost in a muddy rise of water from the creek below; again, it is the rainy season.

We rest awhile upon the high bank and, with the cessation of our motion, we get a momentary glimpse of that of the forest. A tiny woodpecker comes into view, spiralling a tree, and with staccato movements of the head pierces rapidly the bark in search of food. A tanager flies swiftly with a short cry.

High in the trees, birds send forth their song or discordant calls as nature has endowed them. There is one harsh and loud above the rest which fairly hurts our eardrums. The Zoologist, who knows them all, tells us it is the toucan. I know their beautiful variegated beaks, their quick translucent eyes, and bodies of shining blackness, and I think an adage, with slight modification, of a generation ago, would serve—"toucans should be seen and not heard." Unfortunately, here it was reversed, for no mat-

ter how we searched the heavy greenness, we could find no trace of them.

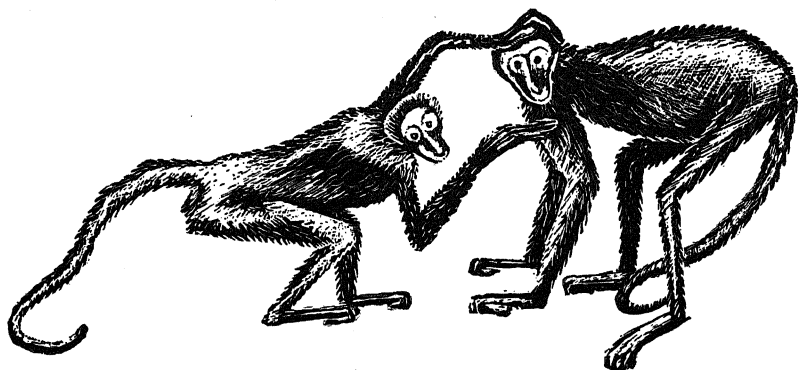
The noon sun is drawing forth the butterflies from the shelter of damp leaves. They are there, and gone as quickly as though they were sudden bursts of ephemeral, brilliantly tinted gases. Try as I might, they are as impossible of capture. It takes the Zoologist, with years of practice, to gage the exact moment for the quick sweep of the net and the short turn to imprison one.

When we return to the hotel, we are a little late for lunch, and explaining to the head waiter, we tell him simply we have been out to the forest. His eyebrows rise in astonishment and he is off again on the horrors of nature. We have heard him many times before, we know it all by heart now, how his tender German skin cannot support the insect bites, how if he ever goes beyond the gravel walks he is beset, and cannot sleep at night for pain. And here in this dreadful city of Belém, the trees are so thick, it is almost jungle everywhere. He waves his hand, fingers outspread, wildly and cries that refrain we have come to know so well, "The florish are coming to town!" His usually good English gets somewhat mixed, and we cry after him, "The florish are coming to town, Some with ants, Some with hants . . ." but we have not the heart to finish.

The head waiter is unhappy, he has come from Rio, the perfect city man, scornful of, and hating the provinces. He yearns for the new, efficient street cars, and bright night life of Rio. There, a girl will speak to you; here, they look askance—that is, the kind you would like to

talk to. He is lonely, for he does not make friends easily. He limps slightly, from what cause I do not know, but it is obvious he is not strong. The efficiency he displays in the dining room, he cannot, somehow, carry over into his other living. As a man he is out of phase. In this provincial city he lives in terror of the "florish" and its accompanying hosts.

He forgets this now and then, and tells me of a shining wing flight he has observed, and always ends with the wish that he could have caught the insect for me. Once he came very near to doing this. A butterfly of such rare colors flew into the room where he was about to take a shower. It alighted upon the wall, and with his towel he almost secured it, he had not been quite quick enough, he was afraid of slipping. But it was beautiful. He bowed slightly, from habit, as he finished.



12. THE ZOOLOGIST AND HIS CHILDREN

I FIND THAT as I describe any of the native men of Pará of any class, I repeat continuously, "He was a little man," or its equivalent. The chief helper in our laboratory was no exception. He was scarcely as tall as I, and I doubt if he weighed a hundred pounds. He was, however, endowed with an agility which belied his sixty years, and to date he had fathered fourteen children. Only six of them had lived—a fair average. This man had the perfect manner of entering a house. On his bare feet he wore a pair of loose-fitting wooden-soled slippers. He would come quickly toward the house entirely uninhibited by the flopping footgear, pause a moment beside the step, and suddenly he would be on the veranda walking silently on bare feet, no trace of sand behind him. The slippers were resting neatly, side by side below the step. The precise method of leaving them I never registered, but it was always so, in an instant—the man inside and the



slippers out. Our entrance was far different and lacking subtlety entirely. Our feet were always encased in North American shoes and our steps were heavy on the tiled floors, a wretched sound of grating sand between them. When the day was over he would make our laboratory spotless, sweeping the floor of dirt, not one grain for which he was responsible.

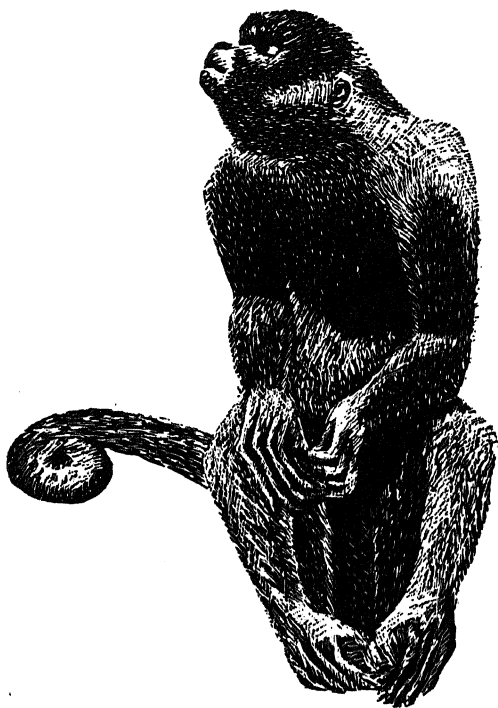
When, for a moment, he was inactive, he did not seem to rest, for there was about him a continual sense of movement as there is in an El Greco painting. The actual form and look of his face was also El Greco. An inexplicable ecstasy was in his too deep-set eyes, and a movement of light across the tight skin of temples and cheekbones gave to him an ascetic look, for which I saw no explanation in his living. He performed his duties in the Gardens, he begat children, he had malaria; that was his circle, and yet he looked like one who had striven eternally with God. When we left Pará and were giving presents to the workers, he asked us for all our electric-light bulbs, and there were quite a number. We gave them to him wondering why he wanted them in a household which went to bed at sundown and arose with the first light. I do not believe he wanted to sell them but just liked the possession of them, the rarity of which among the workers would set him aside forever as a superior being.

He had come to the Gardens as a young man, and had worked there faithfully for almost forty years. He now lived in one of the whitewashed, vine-covered houses beside the east gateway and all went well when he got his pay. But there were months on end when the city administration could not find enough to meet the too low sal-

aries of their employees. At these times the Zoologist would dole out what little came to him as he found the greatest need. He kept a notebook for the workers in which he entered each milreis payment, acting as a banker to each individual. When a full pay came, by chance, they would frequently ask him to hold part of it for them and would go to him for money for every need, from clothes to cigarettes. Their money in the hands of the Zoologist was safe, they knew, for he had never failed them. He found them children, accepted and ordered them accordingly. He was with them, too, in all their daily troubles, doctoring them, and fighting to obtain more quinine when his supply was out and they were shaking. The pattern of his life was made and he repeated it in the accepted order. He cleaned his skulls, dosed his workers, and shouted orders in sudden bursts of Teutonic irritation at the slowness of the southern functioning. This latter was extremely impressive, and might have been somewhat terrifying if one did not know the fundamental gentleness of the man.

I learned much of this while I was making a drawing of him in his laboratory and we were being interrupted continually by a hundred small demands. Even the monkeys came in unceremoniously upon us. I would see a dark hairy arm thrust over the window ledge, long nervous fingers searching for an anchorage, and then the top of a head and two round, frightened, questioning eyes, their glance searching swiftly to see if all was safe. It always was in the Zoologist's laboratory. There would be a loose bound of monkey onto window sill—to tiled table—scuttling among the Zoologist's papers and specimens, a grab at some curiosity-provoking object, and at this point the

Zoologist's loud and threatening voice, sending the thief into a panic of retreat. But he was back in a minute and this time the Zoologist would stretch forth a sure hand and pull the little pest toward him affectionately. The monkey



settled into his arms, stretched its neck toward his face and resting its chin upon his chest would listen to the Zoologist chiding it, calling it "Malandro macaco," and other terms denoting wickedness, and close its eyes in perfect bliss. The shyest of them all, even Preta, the spider, whom no one else could touch, would lie thus.

I was enchanted by these creatures, and much flattered

when Chico, the spoiled baby, began making overtures in my direction. But, finding that I was safe, she would not let me be, and would seize my pencil, sending the line which I was so carefully considering in a wild dash across the page. She chewed my art gum into pieces, gnawed my fingers, and then, pushing under my drawing pad and finding my woman's dress soft and comfortable, would roll herself into a ball and go to sleep. I balanced my pad upon this hump as best I could, and decided that never under any circumstances had I made a drawing against such odds! Amazingly, the drawing turned out well. I was pleased with it as a piece of work and the Zoologist thought it an excellent likeness. He had a most interesting head to draw—the hair so close cropped that it was easy to discern the line of the skull—keen eyes (I would like to have shown their blueness) under bushy brows, a full flowing line to the aquiline, somewhat crooked nose, mouth hidden under mustache—the firm chin not quite hidden by the sparse beard. Since he liked my picture I would have it framed and give it to him. He accepted it with obvious pleasure to send his wife as an anniversary present, to celebrate nearly forty years of marriage.

The Zoologist was not filled with the vision of a new world here, at any rate, and the mass follies of man he scorned alike regardless of the names which cloaked their political philosophy. He would shake his head sadly at the reports of war and impending war as shouted every day by every newspaper.

"Soon," he would say, "I will go to my estate beyond Santarem. Mein Gott, another war! Will you not come with me and be saved?" We knew we could not, no matter

how great our fear, but I like to think of my drawing, that much of me, being safe in the Zoologist's house, far up the Amazon, half way to Manáos.

The Zoologist always thought that we were being "taken in" by the natives, and was constantly on hand to protect us. Sometimes he would settle the issue quietly for us, but again he would find it necessary to roar loudly before the argument was ended according to his wishes.

An occasion arose about this time which, starting slowly, mounted to a good crescendo before it was over, and ended with every participant feeling cheated. It started with the El Greco worker announcing to the Physicist that a man was outside wanting to sell him an eel. He was a heavy-set young man, very swarthy, with a sullen look about him, which made it known to the world that the admixture of blood in his veins had not produced a fortunate individual. Beside him was an old five-gallon tin can, across the opening of which ran a cord fastened into holes on the sides. A stick had been twisted into the center of the cord making a sort of handle. Inside, the entire space seemed to be taken up with eel. When the Physicist bent over the can the young man burst into a rapid jargon of which we could not understand one word, but from the enthusiasm of which we gathered that it was a magnificent eel and that the captor had been through heroics to catch it and bring it here alive. Looking at the comparative size of the can and the eel within, we were unable to know how he had ever managed to get the creature inside, or how he had been able to handle afterwards the unwieldy can with its rebellious inmate.

The Physicist asked to have the eel brought to the lab-

oratory, and as the man raised the can from the ground the stick handle slipped, the can overturned and with the gush of water out came the eel upon the gravel path. The crowd which had gathered withdrew and there were exclamations of fright as the terrified eel helplessly threw itself about. The excitement of the man who wished to sell it was intense. With superhuman effort he had got the eel this far, right to the market, a purchaser waiting, and by some false twist of the handle his goods had been cast upon the earth where it was rapidly beating itself to death. It was more than he could bear; he danced about shouting for help, not daring to touch the eel, but calling maledictions down upon its poor flat head. One of the boys came running with a dip net, and pushing and scooping at the beast they rolled it over and ground it about in the gravel until the Physicist cried out to stop. He made them understand that they must let it alone, and running to the laboratory he returned, hastily pulling on a pair of rubber gloves. The eel by this time was somewhat exhausted and the Physicist had no difficulty in lifting it from the ground and carrying it to the eel barrel in the laboratory. A murmur of unbelief passed through the crowd and they shook their heads at one another as though denying this reality.

With the eel safe in the tank, the owner now came forward with the price—sixty milreis, four dollars. At this the Zoologist let out his first roar. The owner matched him with one almost as good, and these were repeated at intervals for the next ten minutes with considerable conversation dropped in between, the details of which we could not get. The Physicist explained that it was an un-

usually big eel and he would pay its worth willingly. That was all right, but the Zoologist and the owner could not agree upon this point. Finally the Zoologist shouted for him to take twenty-five milreis or the eel. The man was caught and knew it, but the Physicist to pacify him gave him thirty. The man left, shooting a final hatred at the Zoologist; the latter thought us idiots to have gone beyond his price, and the eel—the wretched creature died upon us the following day, its back having been broken somewhere in the process of being brought to the Gardens, most likely when it was being forced into that too small can. The disgruntled native was the only winner, and I doubt he ever knew, but is even now plotting how he can get even with the Zoologist!

One morning, a few days later, as I entered the Gardens I met the Zoologist hurrying out. He stopped to shake hands with me, as he would had he met me fifty times a day, but he was not smiling. He looked concerned and unhappy.

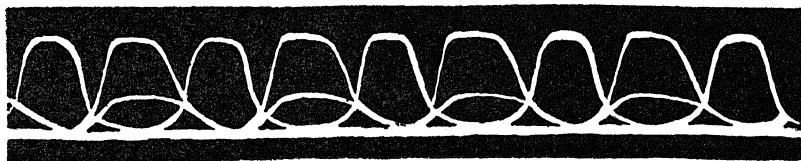
“I have just had word that the Attorney General is ill, very ill. Paratyphoid. A terrible disease. . . . My daughter died of it. . . . My oldest, just over twenty. . . . A terrible disease. . . .” He shook his head from side to side as though in pain. “The Attorney General is not strong, either.”

Remembering the almost transparent quality of the man’s hands as he had turned over slowly, one by one, the drawings he wanted us to see, I felt, too, an anxiety close to that of the Zoologist’s.

“I must go and see if there is any way to help.” The Zoologist did not look directly at me as was his custom,

but his eyes moved restlessly, looking here and there at the uncertain shapes of light and shadow under the trees, as though from their familiar pattern he might gain some reassurance.





13. AS THE OSCILLOGRAPH TRANSLATES

WE HAD BEEN a month now in Pará, and each of us saw it in a different way. The Biologist, who could not repudiate his youth, found every source of gaiety the town offered, and each morning would regale us with his exploits of the night before. Each morning the Physicist would prod him out of bed, trumpeting at him "Six-thirty! Are you going to sleep all day?" The Biologist would call out a cheerful "No, I'll get right up!" and then go promptly off to sleep again.

The Physicist, when in North America, scarcely ever stirred before nine o'clock, but here he was active before the sun, eager to be off to his eels, and presenting me with an early morning cheerfulness which I had never before encountered. As I was awakened each morning, and slowly acquired consciousness beneath the folds of the mosquito netting which draped the bed, I found a certain unwillingness to struggle through to another day of eels. The itch to handle paint instead of rubber gloves gave me no peace. I almost had to shut my eyes to the color of the city as I made my way to the laboratory each day, but I had cast my lot with the Physicist and his eels and there was no retreat.

Not only was there the problem on which the Physicist was working but we must find time also for the experiments "King David" had requested. These were dependent upon the use of animals kept under laboratory control, who were to be fed the electrical tissue of the eel, and to be injected with its concentrate if that could be derived.

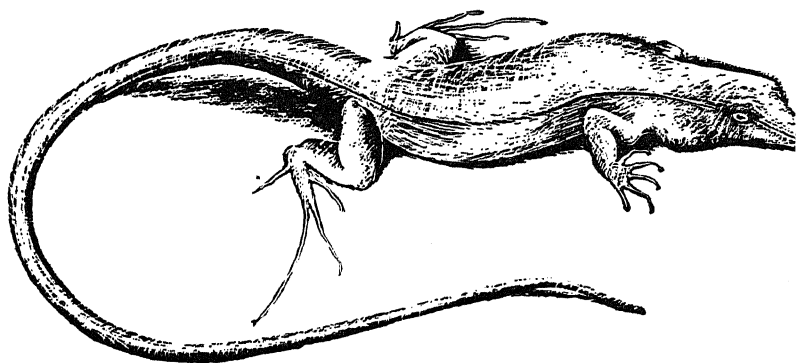
As early as possible we looked for some way of setting up such a program and collecting animals. The Zoologist told us that there was no way we could acquire such animals by purchase, there might be a few rats at the hospital, but not enough for our purpose. The only thing he could suggest was to send out his workers to collect what cats and dogs strayed about the Gardens or roamed the byways and the hedges. This seemed to me a dubious process and as I had been allotted the job of seeing that proper material was acquired for the scientists, I became considerably concerned.

I also became aware of every feline and canine that walked the streets and in all my life I have never seen a poorer lot. They were thin, some to emaciation, and must harbor innumerable diseases. I remembered a New England town where I had spent many summers and whose inhabitants had a passion for cats. Every doorstep was adorned with one or more, sleek and beautiful and complacent. Here if you as much as stretched your hand toward one, he would run with a fear which amounted to panic. What, I wondered, had happened, in this country where the handsome jaguars are still hunted, to his domesticated brothers. The very sight of them made one start in pity. It would take years to breed a lot upon whose

stability an experimenter could depend, and always back of our urgency was that time limit of three short months.

This, we saw, was to be no easy problem, yet we could not return empty handed to King David. The Zoologist began to worry with me, then one day he thought he had it. "Lizards," she suggested with pleasure, "we can get as many as you want; they are carnivorous, and have a peculiar faculty whereby they can lose their tails and grow new ones. The effect of eel tissue upon this growth might prove curious and suggestive. Could they be used?"

We did not know, but with no other possibilities in sight, we could try. Lizards, averaging a foot in length or over, were collected. Their shining blue and green bodies began to adorn the white plaster of the animal cage where they were to be kept, like brilliant mosaic designs. I would watch them in their swift movements, waiting for the frozen moment when I could make a drawing, and wondering just how the scientists would proceed with their experiment. But they never got that far. The lizards could not tolerate this alien environment, into which they were so swiftly thrust, and refused all food we put before them. At first this did not cause us great concern, for, knowing that cold-blooded animals could live a long time without food, we believed that eventually we could encourage them to eat. Then they began to die. Each morning I would find stiff gray bodies. The brilliant colors passed from them with their life force, and only this gray ugliness was left. We got more lizards, but they died as had the others. (I have since thought that it was not lack of food which killed them, but the intense heat on the low roof of the cage.)



Any chance of complying with the Physician's request seemed daily more remote. After consultation, the Physicist concluded that the best thing to do was to send eels as many as we could manage, back to the Physician in New York, where he could try their potentialities under proper conditions.

From now on our whole living became ordered by electric eels, we were slaves to finding out what really was the motivating force behind their peculiar power. These eels must give up their discharge, and the now secret reason why. The Physicist insists. He struggles with their squirming bodies and his mind retraces continually their particular curve of discharge as the oscillograph presented. There is a relation, there must be a relation, yes, between the curves and the organs which produce them. Somewhere there is an equation. To find that equation the Physicist will photograph the discharge of the eel. It is necessary to make static those evanescent green curves so that the curvature might be plotted and reduced to an equation. Perhaps this in turn might relate the force hidden

within this primitive form of living matter to the phenomenon to which we have grown accustomed, the mechanical, man-organized power producing artificial light and movement.

The actual process of making photographs was not difficult, but it must be repeated once, twice, a hundred times. There must be no least chance of mistaking the curve, and each curve must be identified with the section of the producing organ. This was done by placing a camera at a distance of eight inches from the window of the oscillograph and connecting the two with a cardboard tube so as to exclude all outside light. There was a little peephole through which I was to watch the window closely for the flash of green when the eel gave his discharge, so that at that precise second I might snap the shutter of the camera and record the shape. It required close attention on my part, that was all. The difficulty came in the developing room.

The heat in that little room, with every crack and window barred, was almost unbearable and did not make it any easier for me to handle in the dark the unfamiliar spools and films. The films had to be wound with perfect precision, with no inequality of tension, and were not under any condition to be dropped. A few scratches might spoil a whole day's work. There was another item in this set-up which caused me apprehension—bats. The two-room house which had been arranged for film developing had not been used for that purpose for a long time before we came, and so had become the abode of bats, as is the lot of any deserted house in the tropics. The Biologist who had entered first and encountered them was de-

lighted. He rushed out for a net and leaped upon the creatures with the avidity of the collector. The Museum of Natural History was being served: the more the house yielded, the better. I thought so too, when I knew that I should have to work there. In fact, I felt passionately concerned with having the museum get the entire supply. The Biologist assured me he had been thorough, that the place had been completely debatted, but I never felt altogether at my ease there.

Not that I mind bats, under ordinary conditions. The fear they put upon me here was simply the uncertainty. I did not want to be startled into dropping my film and having to fumble about on that dusty floor, in the dark, to collect the pieces, and find perchance a spider or a scorpion. I had seen one of the latter put into an anæsthetic bottle by the Zoologist, who assured me of its deadliness, and I had watched one of the workers in the Gardens trap, with a pair of three-foot pincers, a huge black furry spider, a tarantula. All in all that developing room was no pleasure to me.

Next came the developing baths, and here the climate had us by the throat. They would invariably get too hot, and the films would refuse to dry, and at times even the emulsion had a tendency to slip and slide, carrying with it the impression. But what delight when a roll would come out clean and hard showing clearly those fine flowing lines of the electric discharge! The Physicist would hold them against the light noting with pleasure that the shape of the curves was close to what he had anticipated—I could not follow here and the further struggle with these abstractions was for his superior knowledge.

“Today we will kill an eel and work the organs separately if possible.”

The Biologist puts knives and scissors into use. I concentrate upon pencil, paper, ready for the notes. There is no word spoken for a while, however, only a sound of knife against bone, scissors snipping their way through twitching flesh. A curious dull sound, not like any I had ever made in cutting. Suddenly a smell of ether comes upon me though none is being used. Memories of pain and snipping scissors—tonsils—childbirth. Look up, quick, how green the trees are outside—and see—the tiny delicate leaf of the vine! Let me go—this is not my world—here in this room where scissors snip dully into flesh. Let me go—my world is there, outside—let me see only the delicate line of the leaf!

“Please note this down—‘transsection 1:48 . . . organ set at 1:59 . . . 2:17, tail gives under stimulus about fifty discharges . . . major and minor discharges observed, . . .’ and now would you mind holding this here, or perhaps—?” The Physicist knows too, this is not my world.

I take the fine wires and hold them. “Where?” One against the severed nerve end, the other upon the bare electrical organ. No pain for the eel in this, his consciousness ended fully half an hour ago, but the organs can still make their discharge.

“Hold them still, please.”

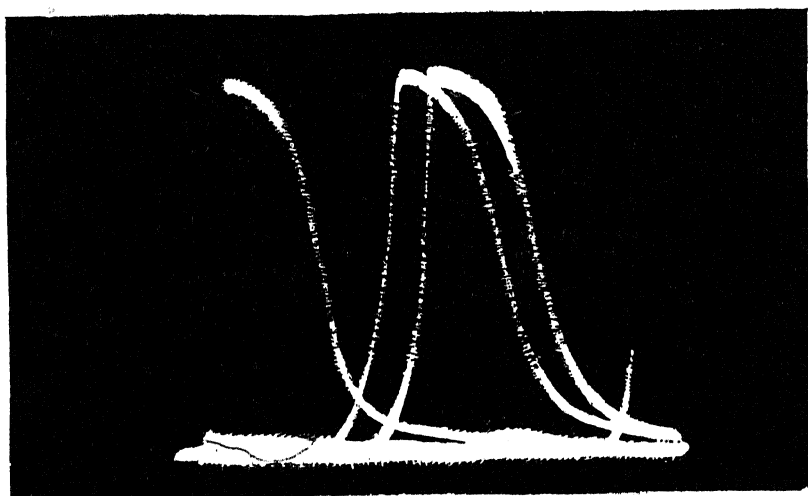
I cannot seek release in the tree greenness now. I must keep my eyes upon the flesh, and say one of those meaningless phrases, “This is important, very important; there is nothing in the world quite so important now. I must hold the wire steady, it must make contact, it must.”

It did. That piece of suspended flesh shot forward like a sharp white tongue, and the green writing danced on the window of the oscillograph. The Physicist bent down eagerly, observing intently.

"Purely automatic," observed the Biologist. He put down the knife and casually began washing his rubber gloves.

The Physicist stood looking into the face of the oscillograph where the quick curves had moved across it and were now gone.

"They are just the same—the same curves—the long thin



one and the short ones—no difference whether he is alive or dead."

I put down the wires, for the white tongue had ceased to lick forward with that quick jerk. I pushed back from my face the hair that had fallen forward and with my

hand felt the sweat trickling down my temples and across my cheekbones. I left the table and went out into the dark shadows under the trees.

“ . . . no difference whether he is alive or dead.”

Reflex—mechanistic—there were words used to explain these things, and for those who knew enough, or nothing, that was satisfactory. I stood midway, knowing too little of the biology and physics of our living. My perceptions had been attuned to another manifestation of it. I felt bewildered.

The Physicist had said, “It makes no difference—it’s just the same, whether he’s alive or dead.” That phrase, not unusual in its colloquial meaning of “it does not matter to the world or any one . . .” here meant something else. It meant, “a part of this creature functions in such and such a way, whether ‘he’ is ‘alive’ or ‘dead.’ His electric tissue is still writing when ‘life’ is gone.” Not long, fifteen minutes, half an hour, at most an hour of our time.

That piece of white flesh licking forward, . . . I wanted to understand . . . that green line—a life curve, repeating itself through death. And no one would have seen it if the scientists had not been looking so intently.

And our life curves . . . human beings scribbling them from one end of the world to the other. They cannot be reduced to a green line of writing. There is something here beyond biology and physics.

When we die, is that curve jerked suddenly out of the world, or is it still there, if there is any one to look, for fifteen minutes, half an hour, an hour, God’s time?

The Physicist came toward me, moving slowly through the heavy shadows as though they were actual substance

against which he must exert an effort or be halted. His hand was pulling at his eyebrow with that wandering movement, which always accompanied an inward struggle. I waited and he stopped beside me, not really seeing me but rather sensing that I was there, as one grown accustomed to a presence.

"Do you know what it means?" I ask.

"Not really. The experiment was to try to find whether or not the electrical organ would discharge after the nerve of the spinal column was severed. It would not, yet a portion of the organ could be stimulated to a similar function. Each tiny cell of the electric tissue is connected by a minutely fine nerve to the large one of the spinal column, and that in turn, of course, is controlled by the brain, just as are our nervous impulses. If we can find one certainty. . . . The culmination may be in the future, ten or one hundred years—when our small conclusion is related to the conclusions of many other small researches to form the basis of a fundamental theory. In this larger theory, our conclusion is as one trace of the discharge on the screen of the oscillograph."

This much, I understand. The experimenter moves along with the stream of scientific consciousness; as chance and his individual ability permit he contributes to its volume. Only now and then is one permitted to see his work shining with a new light as did the Curies their radium.

"The stage for all discoveries is set in continuous time." The Physicist extends his hand slowly the length his arm permits, then lets it drop beside him. "Can we count on the continuity of scientific research—of civilization—for ten years, for one hundred years?"



14. THE WORLD

AS OUR WORK took on a certain routine at the Gardens, and the days began to follow one another with an almost deliberate repetition, the way of living of the Brazilians crept imperceptibly upon us. It did not seem so difficult to arise at sunrise when the still air retained some freshness from the cooler night, and do our work in the early morning. It seemed even less difficult to sleep through the hot hours of midday, and by afternoon it was only with an effort that we could pass by the inviting chairs of the terrace and the clinking glasses, again to take up our work in the laboratory. To the Physicist the heat, the unhurried movements of the people, the tall quiet rooms, caused a satisfaction he had never felt elsewhere. They brought to him a bodily relaxation which made it easier for his mind to answer its own questions. No waste effort to gather together his tall body against the cold, which was in itself, to him, a sort of happiness.

The heat for me was no happiness, and I spent a good deal of time futilely resenting it. I marvelled at the native people who never seemed to resent anything. They accepted the monotony of their days without a protest, their illnesses and poverty they scarcely acknowledged. Life

moved from generation to generation as uneventfully as the breadfruit blossomed, matured and fell upon the ground. This was the face we saw—how, then, was there revolution perpetually in this land?

The Brazilian newspapers told us nothing really, they were too obviously propaganda sheets, and although we were making some headway with our Portuguese, it was not yet enough to rely upon for ordinary conversation. What sociological discussions we had were confined to those with whom we could converse in French or English, and this, too, had its limitations. I began to think that perhaps we had reached one of those periods of “escape,” so continually sought after in this bewildering world, and was almost willing to let it go as such, when the mail boat made its scheduled monthly stop.

First there is the letter from the family, happiness of good news for all are well. The boy, just two weeks under nine, writes, “I have a new sweetheart, Arabella is her name and Oh Boy! is she a honey! Good-bye and don’t forget that caiman.” The girl, not three, sends word she wants a baby cel and “I’ll wrap it in a blanket and put it under a chair so it won’t get sick.”

Suddenly I find it hard to be glad that I am three thousand miles away.

I next unroll a copy of *The New York Times*, something less personal will be easier, I think. But as I skip from headline to headline, the tightness in my throat increases, and it takes more effort each time to unroll a new sheet, until I feel it impossible to go on. Item followed item:

“Roosevelt to ask arms limitation as help to peace. Ap-

peal to Europe is delayed for more appropriate time to win great interest. Domestic perils feared. . . ." "Rigid neutrality now a lost cause." "Auto strike. . . . Strikers continue siege. . . ."

In Russia, Stalin is putting down a new plot against his power, sixteen old revolutionists are being shot, all having confessed with tears and wringing of the hands. Trotsky, exiled in Mexico, protests "lies and terrorism."

In China there is famine. A report comes that near Chungking a rich man's granaries were pillaged and destroyed. For once the magistrate refused to intervene as it was disclosed that sufferers had offered to pay the cost of the grain, but the rich man had demanded a high profit. It goes on to say, "there is enough rice and other food . . . there would be no famine if there were organization for distribution, but thus far the government has done nothing about it."

In Tokio, "when asked whether the Foreign Office believed Japan's neighbors might be alarmed over her increasing armaments, Foreign Minister Naotake Sota made the stock reply that Japan's armaments were 'the minimum necessary for defense.'" But now when maps are made, the color of Manchuria is no longer similar to that of China.

In Germany, Colonel General Hermann Goering shouts, "Let us carry the Fuehrer in our hearts, full of warm love and deep gratitude for what he has done for us all, but more particularly for us soldiers, to whom he gave back the sword."

Certain Ethiopians have thrown bombs at Italy's con-

quering General; several people killed and forty wounded, the General among them. For him the best surgeons are sent down from Italy, and a wholesale massacre of the blacks is ordered and carried out. "Italy proclaims herself a Mussulman power without falling down on her tasks and duties as a big Christian power." Marshal Italo Balbo, Governor of Libya.

An English paper is advertising a new invention no home can afford to be without—a gas-proof baby carriage. It has a window through which the gas-masked mother can look to see if it is functioning properly or if the child is already dead. No home can afford to be without one—in case of war.

Paris states, "regardless of cost France will retain her naval lead over Germany and Italy . . . the Chamber of Deputies will shortly be asked to budget for two more aircraft carriers, 33,000 tons each, to carry about sixty planes each, and two more 8000-ton 6-inch-gun cruisers, . . . and some submarines."

Here in Brazil the papers are crying a new outrage against the government, carrying pictures of a wild woman with evil distorted face, a Communist. I was told by a friend of this woman, a young girl who had known this other in school, "she was beautiful and well known as a poet." There was fear in her eyes as she spoke.

The papers over all the world are crying civil war in Spain, agony and death. England and France have taken 4000 homeless children. Will America take 2000 more?

I put down the papers and open another letter. "March 15, 1937." There is news of trivial happenings of personal concern, and then at the end, "I saw by the papers that

J——, participating in the W.P.A. strike, had been beaten by the police.”

If one had an escape line from earth to the farthest star, it would not be long enough to flee this world's pain. Twenty words which had taken almost so many days to reach me were there crying out upon the written sheet as though alive. It did no good to tell myself, “It is over now, twenty days is a long time, what bodily pain he suffered is gone now,” for I knew that twenty days or twenty years in which to forget brutality are one. What had been the immediate cause of the strike I did not know. Whether his detail of behavior had been right or wrong, was not to me the issue—for this man was, above all I knew, gentle and slow to anger. Yet he had been beaten. None of us can escape to the nearest star—nor even just around the corner.



Some one is calling me, "Come, let's go down and see the U.S.S. *Pickrel*, the newest submarine has just come into port."

We went with other Americans to see. There were on board six officers and a crew of fifty—young men all, for youth is more expert at killing or at dying in time of war. They are glad to see Americans down here. They find common friends and common knowledge of particular places. The officers show their family photographs, three of them have children, all young, their first. They are proud and somewhat homesick.

We are shown the submarine, the very latest and most efficient yet built. Here are the torpedoes, eight feet long and shining. If the enemy ship aimed at is hit, that's one less. Four torpedoes can be carried at once—four ships, if care is taken. How many hundred lives? How many children seeking homes?

Here is the escape tower. If the sub is hit by gun or mine, close the great doors quickly, put on the breathing mask, grab the rubber tube firmly by the teeth, and as the water rises about you, open up the hatchway and shoot through unnumbered feet of water. If you have learned your lesson properly, you will reach the top, and there if you are not picked off by shots, you may eventually be saved.

Escape tower! There is no escape, even the farthest star is too near.

But the boy has a new sweetheart and the girl wants a baby eel. I hear an echo of the question of the Physicist, "Can we count on the continuity of scientific research—of civilization—for ten years, for one hundred years?"



mounts, veiled in flowing purple. Her face is pale, only with crimson lips. She stands perilously upon the stool and unfolds for all to see, her sacred relic, the impression of The Head upon a cloth. It is stamped in sharp, hard outline and bold color. She opens her crimson lips, and in a small high voice recounts, how she, Veronica, received it thus.

She descends and the priest delivers a Latin prayer. The wooden figure in blue beyond, also carried high upon shoulders, stares unchanging. The crowd ahead see all of this, the crowd behind, who cannot see, feel a stoppage to their treading. They halt and raise their heads toward the distant murmur. The incense is now strong in their nostrils. The mango leaves are still in the hot air. Nearly two thousand years ago today, Jesus of Nazareth was crucified.

The evening sun at six o'clock has flattened to an orange disc and, like a nickel in the slot, slips smooth and swift behind the cumulous, white clouds. Color runs, like the painted lines about a bowl, pulling the corners of the world into its circle. Purple mist rises from the red-tiled roofs, and brown, naked children play upon the streets. The great heat of day is passing.

At seven, the night falls heavily upon this flat land, as does the urgent lover upon the waiting body there, beyond the tiled façade. Today is a holiday to be used for love as well as prayer. The lover rises, but no longer sees the body there beneath him, so swiftly has the blackness come.

The lights of the city appear in ordered sequence, spotting the darkness with areas of shining color as Kandin-

sky might his canvas. The Southern Cross hangs in the sky, to remind the foreigner, if necessary, that this is south equator; the incense in the streets, a Roman Catholic country.

The cathedral in the square is dimly visible, knit to the night by two hundred years of graying. The glow beyond the door is caught and held within the sacred area where Christ is laid, His limbs not straight yet from the sagging body weight upon the knees. Women have laid Him there in memory of that first time, but now a small white pillow with ruffled edge is placed beneath the head to ease the burden of the still-pressing thorns. No priest is in attendance. At this hour, God is the people's right. With tender uncertain hands they smooth the cloth beneath Him, and gazing upon His distorted features, cry in mutual and bewildered pain. Suffering two thousand years ago, and half the world around, are now, and here, the same.

The blood stream still flowing from His side has not yet washed us clean, but here at this moment it is caught in a pool upon His side, and lips draw near in adoration. The painted pool is rich and dark, cool, dry and hard with varnish, the painted lips approaching are moist and a warm little breath comes through them as the contraction of the kiss scratches their soft vermilion with dark, crinkled lines. The young girl moves on for others seeking solace. Old lips, pale gray and trembling against the crimson blood; for them, salt taste upon it surely.

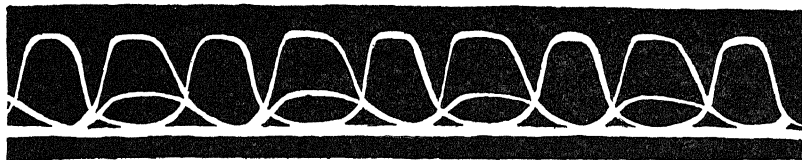
Below the Bier, down five short steps, a little woman stands, looking upward. She does not climb the steps for close approach, for her spine is now bent backwards to

its farthest angle, to support the child's weight within her arms. The steps would break its balance. The pupils of her eyes are wide with looking inward to find perhaps the answer to her useless question. She turns slightly to the right and fixes them upon the Virgin Mary, mother too. She shifts the child's weight to free her hand to search out that symbol in the air. The child's great, idiot head rolls upon her little breasts, and his long helpless legs dangle about her knees. Her hand, moving slowly before them both, makes the vertical and horizontal sign.

Santa Maria de Belém, have mercy on us!



PART TWO



16. COMMUNICATION

“ . . . AND so he dug a hole in the ground and whispered his secret into it and covered it over with earth. But the earth told it to the grass, the grass to the trees, the trees to the wind, and the wind spread it about the world . . . ” until all knew what Midas had whispered into the ground. Whether or not the first teller of this myth actually believed in this form of communication, or merely thought it a pretty figure of speech, we do not know, but certainly it is no stranger than, or even as strange as, many forms we now employ. Communication is but a contact between two worlds, physical or spiritual, and the meeting of invisible messages within a common field of attraction or opposition establishes a contact no less potent than the more readily recognizable one of the meeting of two solid bodies. Communication was born before man, animal or plant existed. It came about when planets were set to whirl in the ether by the First Cause to which none of us has penetrated.

With all the complicated and endless forms which man has employed to communicate with man, he has never, not even with his wireless, superseded certain elemental ways of primitive forms of life. It takes no more than the

shadow of a moving hand to cause the fiddler crab to scurry for his hole—what early clouding of the sun implanted in him this instinct? To divert the direction of march of a line of ants it is necessary only to brush a finger across the invisible path and some wave goes out to them that an alien element has come their way. And more subtle still is the message sent forth by the female moth when she is ready for insemination. The males will come from long distances answering some call for which we have no detection. It may be an odor too subtle for our nostrils, or a sound too high for our ears. Communication is endless, and in all its vast ways there is no method more intriguing than that of the electric eel.

It has been observed that a single eel can quickly gather a number of his kind about him, and that the form of communication is electrical seems a natural conclusion. What code then does he use? In what form does his language become transmissible? What really are the meanings of the electrical impulses which he almost subconsciously discharges?

Here we are concerned with a particular use of natural energy, the word for which, "electricity," for all its familiarity, is no more than a talisman for the majority of people against something which they do not understand. This energy has become, by man's conversion of it into usable form, so everyday a phenomenon that he has almost forgotten the time when it existed only in the elemental forms with which primitive man came in contact. And primitive man had no knowledge with which to put together an explanation which might connect the forms by which this energy is released. For him surely there

was no relation between the thing which tears apart the sky with a fierce light, and falls upon the earth with hot tongues and consumes the trees or the primitive abode, or strikes dead a man or animal, instantly, and—a certain sluggish creature lying in the mud of a river bed. Yet this creature is not like other fish in the river; there is about him a strange power which can send a man shaking, physically shaking but not from fear. What is it? The primitive does not know. Neither does he know what is the light which shoots out in the dark when a shell comb is pulled through the tangled hair, or again that there is any connection or similarity between these happenings. Even civilized man did not surmise this connection until just two hundred years ago.

The first recorded statement that we have of man's concern with the effects of electricity comes from the Greeks, six hundred years before Christ, but here it got no further than the observation that amber, when rubbed, will attract light particles, and that a certain mineral, now called loadstone, will attract iron. This observation, however, prepared the way for the term by which we know this form of energy, for from the Greek "electron" for amber came our current "electricity."

But man playing with a magnet or a piece of amber is a far way from understanding the effects of electricity, and the ways by which he arrived at his present knowledge were tentative and confused till so short a while ago that the space of understanding is hardly a dot's length in the full existence of time. And still the mysteries confront them. For us it is the electric eel. How does it happen that this ugly creature, lying in the mud of a river

bed, has a power identical with that of the lightning bolt? The Physicist's knowledge tells him that it is not inexplicable that they have a parallel behavior. Each is an "effect," an expression of "energy." Not an isolated effect, but a power synonymous with that of the river which harbors the one, and the atmosphere which produces the other. But this is no closed circle. It takes into its line of movement all the energies of our physical world. The river gains its energy from the wind-driven clouds breaking against the mountains, the clouds are the mist drawn up from the ocean by the rays of the sun. Here is the Source which we cannot approach.

But it is easy to reach the mud. And the electric eel lying in that mud may be an abhorred and dangerous object, for whom no one would stay the killing hand—and yet he, too, has the answer to the secret. And how are we to understand?

The scientist is nothing daunted. Already having pulled from the ether so many secrets, he approaches the mud. The knowledge it has yielded is as delightful to the scientist as the feel of it between the toes of the small boy who takes off his shoes for the first time in early spring. Soft, warm, delightful mud between the toes—for this sensation the world was created! The scientist not only digs his toes into the mud, but he burrows out all the minute life it contains, and ponders on the beginning of existence. Out of the mud, too, he lifts up the electric eel and carries it away to his laboratory. He places it beside his wires, his buttons, his metals and his acids. He will reduce them to similar components. Having already found out so many things, he will duplicate the electric discharge.

By his visible tools he will repeat their invisible language. He will invent a phraseology, the fundamental meaning of which he will not understand. He guesses that a certain discharge in the language of the electric eel means, "Come this way, here is food," or "Here is danger, help!" or "Conjugal bliss awaits you." At any rate he will enter their world of communication and fool the babies, fooling himself at the same time, since he won't really know what he's saying.

To duplicate the electric discharge the Physicist must proceed in the most orderly of fashions. From careful measurements of the height of the tracings on the photographs of the discharge made from the oscillograph, the voltage is determined. The average eel we have is a little under three feet in length, and his electromotive force that of three hundred volts. Not hard then to produce the same voltage with sufficient batteries. From the batteries the discharge will be carried through a network of foil and wire, and, if all goes well, the eels will think this a legitimate family call and approach the source of power. These things are a matter of calculation, all very abstract and precise. But how can a battery, consisting of two metals and an acid, enclosed in a certain relation, produce a similar effect to that of living tissue? Think about this for a moment.

The scientist, knowing his metals and his acids, has the explanation of what happens in the battery. Take, for instance, a battery made of a sheet of zinc and a sheet of carbon with an acid in between. The acid attacks the zinc which begins to dissolve. Its energy also becomes fluid and can be channelled off through wires and applied to what

purpose the scientist wills. In this case it can be brought to function in a fashion similar to that of the living tissue of the electric eel. Of what then is this living tissue made? By analysis it, too, is reduced to certain names, hydrogen, oxygen, carbon, chlorine, potassium, sodium, calcium. Yes, it is all there, the hieroglyph is correct and for the one with knowledge the translation is readily understandable. But, again, we on the outside ask, "Why, then, if it is all a matter of chemistry and physics, does it take no more than the severing of one nerve line in the live eel, running the length of the spinal column, to cause the electric organ to cease its discharge?" The nerve is the trigger starting the chemical action, and a step back, the nerve is but a wire carrying a message from the brain of the creature. His brain registers and responds to his physical sensations—that it is developed enough to do anything more, we doubt. His electrical discharge is the simplest of codes, "a three-letter language," one for the major discharge, one for the minor, one for the intermediate. And, as we have seen, the electrical organs consist of three, the major, Hunter's organ and the bundles of Sachs. The Physicist traces the relationship between them and finds the answer satisfactory. A particular organ produces a particular curve, the height of the curve denotes the voltage, the letter is established, and this "three-letter code" is known to be the language of the puraqué.

How simple and direct, to express all one's wants in three letters! Compare our full alphabet, our exuberance of words, our endlessly complicated syntax, still in the building, on and on for thousands of years. Has there been a comparable evolution in the language of the elec-

tric eel? In other words what changes have come about in the electrical tissue since the beginning?

There is a theory for the evolution of the electric tissue of the electric eel, which is based upon studies made on the embryo of the electric ray. No scientist has ever obtained embryo of the electric eel, so until one does, we must suppose that the evolution of the two is similar. In the embryo of the electric ray certain muscle fibers shorten and thicken with maturity until they become units called "electroplaxes." These electroplaxes are little electric cells, operating on much the same principle as the cells that go in a flashlight. The nervous impulse starting at the brain and running down the nerve of the spinal column to one of these cells does not produce a contraction, but the electrical discharge in the nerve makes a path for the electric current to flow from one cell to the next. So the cells pour their electricity all at once into this current and the great release of electric power takes place. It is the most formidable of languages. The evolution from a muscle, producing motion, to tissue, producing electric current, undoubtedly has its advantages, and with this change the eel has acquired a power literally "as quick as thought." The motions of our bodies, even the wink of an eye, are a hundred times or more slower.

To reproduce this language, then, is the Physicist's job. The first setback is when he discovers that to purchase in Pará sufficient batteries for his purpose would cost more milreis than the expedition could spare. He appeals to the Pará electric company for aid and from them secures a generator. With this he cannot produce the identical discharge of the eel, but he can send into the water an elec-

tric current which may be close enough to invite response.

The Zoologist wires off for us a section of a clear pond where there is running water. Here, for a time at least, we can observe the behavior of the eels we will bring from the outer pond whose water has become opaque from their continual burrowings. The workers in the Gardens find this transference an interesting occurrence and gather about the Physicist to watch what will happen next. They see him bring out two long lengths of wire, both attached to a small mahogany box, one ending in a bamboo pole, the other dangling loose. The pole and the loose wire are dropped into the water, and the Physicist seats himself upon the bank and begins to turn a handle issuing from the brown box. The workers must think all this very strange and meaningless, but with patience they continue to observe. They watch the Physicist sweating in the heat, they hear the grinding of the wheels within the brown box, and following the direction of our earnest gaze, they look into the clear water of the pond and see an eel move slowly from the cool shadow at the pond's edge, push forward and rub an inquisitive snout upon the bamboo pole. With caution the other eels join him, and I give an exclamation of delight.

"You've done it, you've found their language, there is contact!"

The workers sense our excitement and without knowing what has happened they smile with pleasure. These are the witnesses of man's message to the electric eel *in his own language*.

We, ourselves, have not much idea what it means, only that the discharge from the apparatus has brought the eels

into its electrical field. Funny business! We talk to them without knowing what we say, but they "get" us somehow. And do they have anything to say to us? The Physicist has an idea. He attaches earphones to the wires, drops them again in the water close to the eels and listens intently. He smiles, takes off the earphones and hands them to me. I put them on. From the water, sliding up the wire, comes a message, a burring sound at short quick intervals. Every nerve tense, I listen, to understand. But I can't get any further than the burr. I remove the earphones; after all, I remind myself, I'm not an electric eel and say as much.

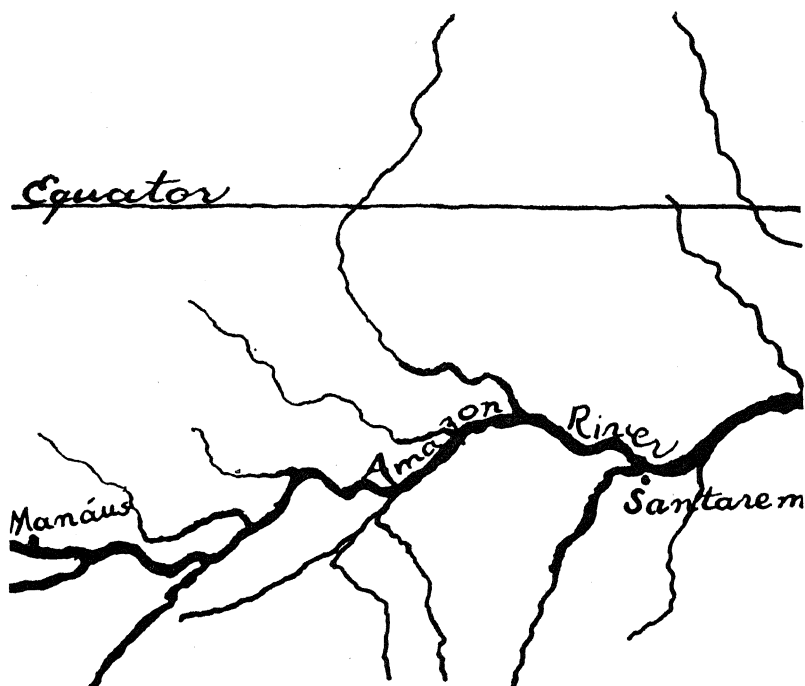
"Give yourself time, give yourself time," says the Physicist. "Don't be too impatient, no telling what you may evolve into. You're doing pretty well as it is—Artist into Scientist, that's a step, you know. Eventually Scientist into Electric Eel—can't tell, stranger things have happened!"

"Don't be so facetious," I warn him, "or limit these chances of evolution to yourself. You're considerably nearer than I. As it is, you are already frequently spoken of as 'the eel man.' I haven't noticed any signs of resentment from you, either. Now, once when I heard myself called the 'eel woman,' I made a protest, I disclaimed all relationship with you, I insisted, 'I have nothing to do with this business. I'm merely an humble artist.' What's more, I want to stay one!"

"Maybe, but you're in now, can't get out yet."

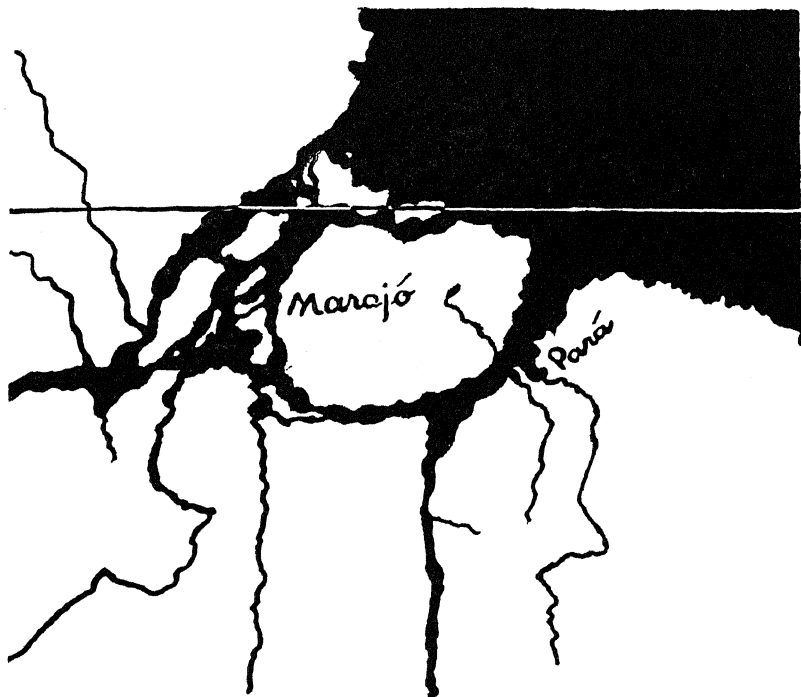
Yes, I was "in," and as eager for further experiment with this new form of communication as the Physicist.

We wanted to go into the streams where the eels hold



sway. We wanted to meet them on their own ground, and converse with them in their own language. The idea became an obsession and we cast about to find some way of accomplishing it.

Shortly after our arrival in Pará the Physicist had received a letter from an owner of a large fazenda on Marajó Island, offering to assist him in the procuring of electric eels which abound in the muddy waters of that Island. Until now, work at the Gardens had been of the first urgency and we had had no time to plan trips away from it, but the success of the "eel caller" gave us every valid reason to proceed further along this line. We began in earnest to look for some means of getting to Marajó



Island. The Physicist looked up the letter so long neglected, written in good English and bearing a feminine signature; we would make contact with its writer. Then our maps of the Amazon River were unfolded, to find the place.

The great island of Marajó which lies between the Pará River and the mouth of the Amazon proper is not difficult of location, even on the smallest map. Its area is as large as the country of Switzerland, but there the similarity stops abruptly. It has no lofty snow-capped mountains and snug enticing valleys for the lure of tourists.

The island stretches as flat as the sea, with an occasional rise of land not much higher than the tallest waves, and

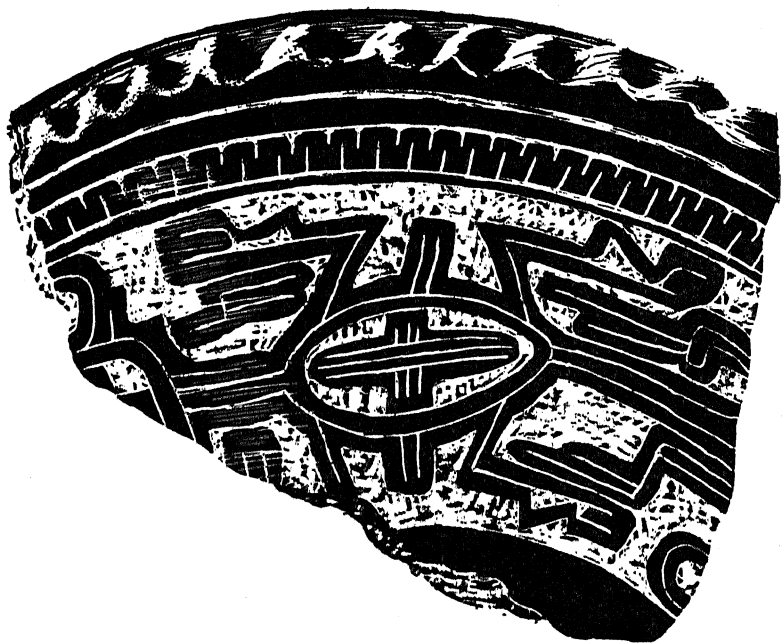
when the rainy season comes, these are about all that escape the floods. An occasional "city" dots the outer edge of the island toward the Atlantic, but leave these and the only markings upon the map are the names of rivers and lakes which thread the land like a gigantic web. To find the names of inland towns one must get a much larger map than we have, or make inquiry.

And to what purpose is this great island put? This is one of the largest cattle-raising areas in the world, we learn. And the population, consisting chiefly of Negroes who care for the cattle and large fazendas of the well-to-do Brazilians and foreign land owners, lead lives almost as elemental as the original Indians who have long since disappeared.

The first white men coming to the island found scattered groups of primitive and peaceful Indians, who thought it better to withdraw than be enslaved, and so until the Negroes were imported this vast area remained uninhabited. Now and then as the foundation of a house was dug on the higher lands, bits of Indian pottery were uncovered, hard and strong still, and adorned with beautiful and intricate designs. In the Museu Goeldi are rare pieces and in 1924 an expedition from the Brooklyn Museum, New York, excavated several burial chambers and carried back with them intact an urn four feet tall, containing the bones of one of the aborigines, and many small bowls, jugs and plates of varying sizes. They all bear a perfection of abstract design, and a variety which is extraordinary. The pottery now made by primitives in the far reaches of Amazonia can in no way measure up to this prehistoric reminder of a lost people.

This island, then, with its buried art and its live eels, was what he wanted.

We met with every possible discouragement—there would be no eels because of the rainy season; there was practically no way of getting there. Once in a while there was a boat which ran to one of the northern “cities” but we were assured that the accommodations would be beyond our endurance, and if we went that way we would have to return the following day, or compose ourselves for an indefinite stay. The space-time element existed here in a size out of all proportion to anything we had ever known before. Going a few miles might mean days, and a few hundred, weeks. Every time we made an effort to



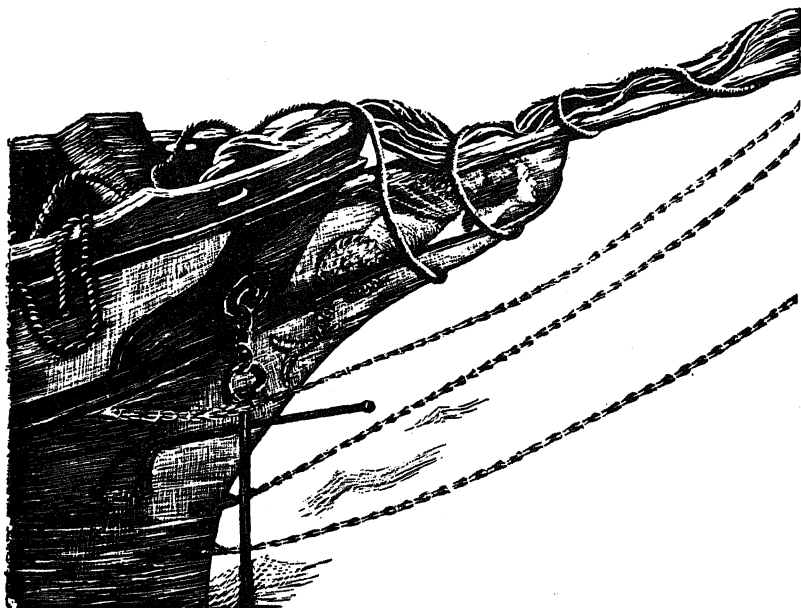
get out of Pará it mounted there before us, unseen but strangely potent.

We referred again to the letter about the eels, bearing the feminine signature, and saw the postmark "Belém." The address which we had hardly heeded was "Avenida Nazareth," the number, a few blocks from our hotel. We learned that the head of this Brazilian family with the fazenda on Marajó was indeed a woman, the widow of the original owner, and now in her own right ran the cattle ranch like any man. Sometimes she was in Pará, but more often on the island supervising the men who worked for her. We would be fortunate to find her. Here, at least, luck was with us. We found her on the Avenida Nazareth, chic and gracious, with an appearance more suited to a drawing room than a cattle ranch. We put before her our desires, so difficult of accomplishment because of lack of time, and asked her help. She told us that in three days she would be going to the island on a cattle ship, and that if we would put up with the inevitable discomforts of such accommodations she would gladly take us with her. The cattle ship would spend one day at Marajó for the men to load the cattle, and return immediately to Pará. We would either have to make the return trip with them or wait an interval of three weeks or more before there was another boat. Of necessity we must return with the cattle.

We prepared against heat, cold, insects, drowning, famine—even for the amenities of life, for I took with me a silk nightgown, and was amused to find it on our return, crumpled in the bottom of a duffel bag, unused. There was our bulky lot of apparatus for "hunting" eels, and three cameras, to make certain the trip would be recorded.

The morning we were to leave, the Biologist, who had for some time been having difficulty with an infected hand, was in such bad shape, he decided he had best not go into this uncertainty. With some misgivings, but with arrangements made for him to fly to Miami should he grow worse, we loaded our paraphernalia into a taxi and gave the name of a dock a short distance from the city.





17. FRIDAY, APRIL 9, 1937. DOCK 9

HERE WE WAITED for the hour of leaving. The fastest cattle ship which went to Marajó was there to take us; two-masted and, too, a Diesel engine, latest model. Her name, *Hiate Major Barata*. The "Hiate," meaning "yacht," was oddly out of place, considering her function. The "Major Barata" was for the past governor of Pará, of whom strange stories reached the listening, foreign ear. The rich said, he is very bad, he takes our lands—and he did, too—and parcels them out to workers, and so gets many little votes. The poor said, he gives us food and schools and places for the sick—and he did, too. The foreigners said he is stupid. He does not want us here be-

cause we are more enterprising than his sluggish native people. Anyway, he shut down on certain immigrations.

His namesake here was to take us to look for eels, and see the lands of cattle, which were half of Marajó. The rest was left to Indians, now extinct, snakes, electric eels and caimans, not extinct. The part we were to see was beyond Lac Arary, one hundred kilos direct but twice that number by tortuous windings of the river, and *Major Barata* would take fourteen hours for the trip.

The crew was ready; big, black Portuguese-speaking bucks, no white among them. They were waiting for the *Senhora*. *Senhora Madama*, we heard her called, that a title of peculiar respect. After I had seen her in command, I thought it might have been extended even more—*Senhora Madama, Capitana, Generalissima*—a woman in ten million.

Here she comes now, of average woman height, compact and erect in well-fitting riding habit of a light, slightly faded khaki. Her marcelled hair is held close in a convenient net. The line of eyebrow is diverted, leaving the curving eye socket, pencilled in a sharp, straight angle upward at the corners. Powder, rouge and lipstick are carefully handled to complete the feminine physiognomy. She comes, walking quickly in high-heeled sandals, one red-enamelled little toenail of each foot peeping through the black leather lacings. She greets us quickly, cordially, in clear French. Her fingernails are carefully enamelled, too. She hopes we have not had to wait.

The men move quickly now, and load her baggage, personal, and bags of farinha for the people, cement for a new house she is having built. The Diesel puts the ship to

trembling and starts it across the river through the innumerable, small islands which play a shifting game upon the waters. They slide, one behind the other, disappearing and now coming into bold relief, until the bewildered stranger knows not which is which.

The ship goes slowly here, but when the bay of Marajó is reached, the sailors undo the two great sails, and with a clatter of rope and metal, they rise into the wind and billow in a burst of azure so deep the bluest patch of sky beyond looks pale and gray.

The passage now is wild and swift, and we lie upon the bottom of the ship to be safe from the wide sudden shift of the main boom.

The wind has ceased, the sails are hauled in and we arise to see that we are entering the mouth of a narrow river. There is a miniature island before us made entirely of piled-up rocks. The Madama tells us that this is where they have to come for building rocks. And curious, too, all of the rocks along this river are found on the left side, going up, the other side has none at all.

We look to the left and see the low rocky cliffs, we see also a wide verandahed house and the gray-white façade of a little church. Here is staying a brother-in-law of the Madama's. We may disembark if we like and look about. We clamber up the tall ladder to the pier as now the tide is out and the boat almost on river bottom, and are greeted by a small brown man in cotton jacket and blue trousers. He is gracious, listless, with a wave of his hand and the place is ours. The Madama walks ahead, twice the man he is, and tells us what is here and there.

The church, now bare, and hardly ever visited, was built



with artistic care. The line of the cornice rises, with a long wave sweep, to the cross on high. The whole has grayed and mellowed to a soft beauty. Within, the walls have taken on an outward pressing movement as they mount, a little more and the years will let in the sky. But now the arched ceiling is intact making cool and shadowed the empty space below. No signs of worship now, neither priedieu nor holy water. The hard, uneven floor was broken once, and you can see why if you move up to the left near the altar. There lies a single flat grave slab. Upon it are inscribed the name, the span of living, and some one's last tribute to the relative beneath.

Curious how easy it is (and encumbent) to find a recommendation for any man, once he's dead. Does the body rot more slowly then, or the soul reach Heaven sooner? Sometimes all that is said is "Rest in Peace," to lend hope in the cluttered graveyard. Perhaps this one here alone will have a better chance.

My hand brushes against the rough wall, and I feel something sticky, but scarcely more than air weight, catch about my fingers. I withdraw them quickly and see a piece of spider web hanging on them in which is entangled a pair of small, transparent wings. I raise them to observe what kind of insect, but there is no body between them. The slight movement I had noticed was only when the web transferred to them the motion of my hand. They have a crooked angle now which would not permit them to adjust to a body were it there. The spider had her meal some time ago. Death's peace is in this house.

The Madama inquires if we are Catholic. "No." She moves from us then, forward toward the altar, a crucifix

still there, and makes her genuflexion and short prayer.

Leaving the church, we pass through tall grass to see a workman's house; a little three-room, palm-thatched shack. Beside the door lie several pigs, and a flock of scrawny chickens search in the short grass for insects. With them is a tall-legged scarlet ibis, who thinks himself a barnyard fowl. In a New York zoo he would bring what would be a fortune to the workman, but neither knows it.

We enter the house and, passing through a common passageway on one side, reach the rear room. It is half room, half porch, roofed, but with walls mounting only part way. At the moment the workman, his wife and daughter are occupied with a freshly killed beef. It has been quartered and the great red parts are hanging from the low ceiling, a thin drip of blood falling upon the hard earth floor beneath. A dog and cat push their noses into the little pools and lap apathetically. The cowhide, newly ripped from the fresh body, has been thrown over a horizontal pole in one corner. On the stove is a pot of simmering entrails. The whole is so close together in the small room you can scarcely move between. My civilized stomach shouts a silent protest, and I try a retreat toward the doorway. But I haven't seen all yet. The smiling wife brings out half the year's supply of turtle meat, a dozen of them, alive, strung together on a cord passed through a hole in the shell of each. They can be kept thus six months. The turtles squirm helplessly, and, as I look, blur into a monstrous mass. Only the clear matter-of-fact voice of the Madama, explaining courteously, pulls me back into reality. When I get out, the hot air seems a relief.

We must outrun the tide now, so as to reach the ship

before it is left upon the earth. Too, another cattle boat is approaching, a noisy bell ringing to tell our captain to make way; others want the sole pier for a moment. The sailors call greetings and the Madama waves to the gentleman rancher, lolling in his hammock on board. He also is headed for the Madama's ranch, but his boat will take six hours longer than *Major Barata*. Why not, then, swing a hammock?

No one on the *Major Barata* takes such ease. It is not the Madama's way, and the men seem tireless. They had only just come back today from a long way up the Amazon, days of storm and no rest in the night time either, but they show no signs of fatigue, yet. These big Negroes are no doubt the descendants of slaves, held either in Brazil or the islands north, but no shade of servility touches them. They are free and self-reliant, and there is a carelessness about them which means relaxation. They wear their tattered, heterogeneous garments with an abandon which is but a concession to a more conventional world than that to which their spirits in reality belong.

The captain, over six feet and broad, manages the entire ship and steers her too. He is at the wheel now, his long, self-confident hands making it revolve as delicately as a woman might a spindle. He leans forward, his eyes intent to catch the shapes of trees and banks in the fast-approaching night. The river here is so narrow that a slight foot's length aside would run the boat aground. We sit on the roof of the engine room, there being no deck proper and there the Madama spreads forth the evening meal. There is meat and rice and little rolls stuffed with chicken, oranges and bananas, and even a bottle of good

white wine. The cook is leaning toward me, his hands together and outstretched before him. I look into their huge depths, and there I see a little flowered after-dinner cup of coffee.

The stars come out and the ship's forward light falls upon the close banks, now right, now left, bringing the leaf mass of the trees into clear outline. The supper things are cleared away, and we stretch flat upon our stomachs on the roof. It is too short to accommodate the six feet three inches of the Physicist, and so part of him rests suspended, and all of it comes near shooting off a moment later. We are jerked forward suddenly. Surprise and ejaculations from the crew, the captain's voice is raised in anger. We are aground. For one short moment so that he might drink his coffee, he had called one of the crew to take the wheel.

The engine is reversed to no good, we'll have to wait for tide power to lift us out. The crew do not seem to care, they gather in the bow, one with a guitar, and to his playing sing low songs. Carnival songs, the Madama tells us.

The carnival had finished just before we reached Pará. We remembered now the young boy who had come aboard with the Brazilian pilot to bring the English ship into the harbor. He had been out weeks, and was returning now that the carnival was over. The year before he had been there and had had so gay a time that his father made complaint. This year the father thought the carnival the most convenient time to send him to the pilot ship for his apprenticeship.

Carnival days were in some ways the most momentous

of the year. There was an American woman in Belém who knew. Her maid had been found with child shortly afterwards, and she felt an obligation to see that the child arrived legitimate. She took the young girl and the male responsible to the magistrate for formal marriage. The magistrate smilingly urged the American not to take the affair so seriously, the year before he had performed one hundred and twenty marriages just one month after carnival.

These days of unusual freedom were beneficial in other ways besides increasing the population. They, for the moment, took care of the self-expression of the people. I heard it said that there had never been a revolution until some time after carnival. That, and the wet season, limited the outward show of unrest to half the year, but there might be a revolution any other time. And when it came it was rarely undertaken by the mass of the people, they were too gentle, almost apathetic. It was the enlightened students, or the military not so enlightened. There were always soldiers marching in the streets, and when the officers came to the hotel the best was theirs.

I wondered if these blacks, spending nearly all their days and nights upon the water, had contact even. If they knew the carnival why not the revolution too? But they were very far from both now, and they waited, singing, for the tide. There was sound of motor, and the other cattle boat slipped by us, almost touching in the narrow way. The crew laughed at our predicament, ours responded that we'd beat them yet. The good-natured rivalry was strong.

The men, tired now, had ceased their singing, and were stretching out on any horizontal plank about the



ship. Sleep came quickly to them, for the tossing indulged in by those on softer beds was out of their experience. They rolled up anywhere and slept.

The timid birds of day had each sought out its tree or bush, sleeping too, head shadowed under wing, warming its eggs or young, or, lacking these, its own feet. The brown-feathered, long-necked heron were flying in threes or fives, or more in arrowlike formation. Their long, low calls passed us, floating in that narrow space between the clear stars and the water. The night sky seemed no more than the mast's length from the quiet earth. The owl's short, questioning cry ran searchingly through the trees, and small night mammals, hearing it, ran quickly for a hideout.

We pulled a blanket over us, the first since we had reached Brazil. On Marajó the night air was cool, and seemed sharp against our faces after so much heat. We drowsed, without really touching sleep, and were conscious soon that the roof on which we lay was again trembling over the vibrating engine. This meant the tide was in and we were moving in mid-stream. Half sleep again, and the banks so close that the white tree branches seemed, in the ship's light, like long arms reaching out to touch us.

Now and then the river would broaden suddenly to half a mile across, and the wide stretch of water would be dotted with clumps of trees, only the upper parts of which were visible. This was savannah land completely flooded now it was the rainy season. In six months' time, this same river will have dwindled to a tiny stream, and the myriad creeks feeding it will be dry earth.

We must have fallen hard asleep, for I awoke with the rain spattering in my face, and the engine quiet beneath me. The night was quite dark, darker than when we went to sleep, for it lacked the stars, and the rain was coming very fast. The Madama was telling us to move quickly under cover but when we went below to the small cabin next the engine, the heat was so intense we preferred the rain. But why had we stopped here in the night? That Diesel had been overworked and was now protesting. The engineer, a small mulatto, was sweating in the hot room, removing screws and nuts, scraping, hammering, trying to persuade the parts to go together. Others of the crew went down to help.

We, being useless, crept under a piece of awning to keep out of the rain, and holding a watch in a slit of light from the engine room, saw that it was three o'clock. This is an hour to sleep through, for somehow it is never good to those who are awake. To be awake at this hour is to be on the other side of happiness, whatever it tells you or how wide the differences from one man to the other. There is the sudden awakening, when the wrong of past living rises up to assure you that the future is a repetition of the same. No matter how you squirm, life has cut out your pattern and you are being pinched, or pulled, to fit it, as the case may be.

The watchman, for whatever reason, who is awake at three A.M. has, by then, become restive, and watches the sky wondering if the sun might perchance come an hour sooner to release him, knowing all the time it won't. And for the worker at this hour, his eyes are heavy battling its weight. This hour even steals the satisfaction from a

mother when she lifts up her child, for she is apprehensive then, knowing well no child should be awake at three A.M. And those who have been playing all the night may still go on, but there is fatigue upon them, or soddenness.

Here at three, we know it is a wrong hour, too, no dawn yet nor even bird-cry to herald it.

We stayed there until our limbs became so cramped with being doubled up we had to move. I got up and went down to talk to the Madama. She was standing in her cabin smoothing her hair and adjusting the eyebrow line to the perfect angle. I felt embarrassed, for I knew that my hair and face and all must be awry. Somehow, four o'clock of a black morning on a cattle ship stalled in the middle of a tropical river seemed to me a far cry from a beauty parlor. But the Madama had brought hers with her, and when she stepped out into the engine room to consult the men, her face was done in every ordered detail.

The delay was serious, the cattle ranch would not be reached 'till noon, and all the loading would then have to be done in the great heat of day. This gave the Madama some concern, and then that other cattle boat would get there first, that meant more delay and a certain loss of superiority. It was bad to have *Major Barata* worsted.

We withdrew and waited in the dark, wet night. The cook came through the rain offering us coffee in those little flowered cups. The time dragged slowly, the mosquitoes having found our boat began feeding on any bit of uncovered body they could find. We remembered all the warnings we had had before we left America and stories of malaria and yellow fever, then ignored, now became

insistent. I wished I had, at least, taken more precautionary quinine. I thought too of the Attorney General, his life still wavering.

It was nearly six o'clock before the dawn was bright enough to see by, and then the day came as quickly as the night had fallen. On board were two new passengers, come out of the night; I knew not when, but their canoe was there, tied to the boat's side. They moved so quietly, I felt that a dozen such as these might have slipped aboard without my knowledge. These two were an old Negro man and his daughter, this his last, going upstream to meet the girl's betrothed, who was a cowboy on the Madama's ranch. And not a very good one, either, it was said.

She was eighteen, well grown, with full woman's breasts, and a gentle way. Her hands were long and slender, and she moved them slowly as she tried to press the thick, kinky hair close to her head. It would not stay, but rebounded, and stood out a wide black background to her small oval face. The father was rearranging their things in their canoe, a gourd for drinking, a few fresh fruits, some farinha, and in a canvas bag, all the maiden's earthly possessions.

I was surprised that in so remote a world, the people undertook the formality of legal marriage. "Certainly," said the Madama, "there is usually a priest somewhere, and the bride must have her white dress and veil here as well as any other place." Frequently the Madama brought materials from Pará for the wedding clothes, and the women sat there in their houses on tall stilts, with the pigs and chickens sheltering below, and sewed as carefully and creatively as Parisian couturiers. True, all the dresses

were sewed up the sides with straight, little sleeves, but they were so few and far between that I felt sure, each to its owner was a new creation.

Ho, now! *Major Barata's* engine is at work again, and we move forward.

It was eight o'clock and already hot. The trees were thinning on either side and wide-open fields of grazing land stretched out flat as a pie pan, as far as one could see. The occasional houses on tall stilts, looked like giant long-legged birds cooling their feet in the high waters. Each house had beside it the canoe for egress. The children played in the water as ours might in a daisy field. The little boys were all naked, but the little girls were decorously dressed in one-piece shifts. They waved and called to us in greeting and some of the older boys, swimming out, tried to catch hold of a loose rope swinging from the boat. A bell which had a familiar sound was ringing, and I looked up to see that rival cattle ship returning, full. Her crew were quietly triumphant and ours chagrined.

Lac Arary was now before us, an oval of blue sky splashed upon the earth, bound by the low, green trees.

Only on the far side was there a break and from this shone a bright vermilion spot—the roof of the Madama's house. Guards were posted on the river at the beginning of her land to prevent thieves from making off with her cattle down the convenient waterways. It was, at times, quite a business. This trip the Madama would make her headquarters with the family of one of these guards, whose house was nearer to her cattle lands. This man now came out to meet her, a huge black with a great guttural



voice and a wild eye. A formidable guard, no doubt, but did the Madama have no fear herself?

This time she would stay twenty days, no white face to look upon, except the maid who accompanied her, unless occasional encounter broke the rule. She must go to all her stations and the last one was two days away by horseback. "Are you never afraid?" I asked. She made a gesture toward her hip. "I always go armed." I noticed for the first time a slight bulge under her coat. I expressed my admiration of her courage. Knowing, too, that Brazilian women of the better class rarely ventured beyond the home unless accompanying their children abroad for education, I marvelled how this came about.

There had been no other way, her husband had died, leaving her with five children who must eat. At first, it had been difficult, the men did not want to work for a woman, "but now they like me; I bring them and their families many little presents." She smiled at such simplicity of ingratiation, "They are like children."

Perhaps they were like children, and difficult, too, when not pleased, I could imagine. But at this moment they were accomplishing a far from childlike task. *Major Barata* had reached the spot at last where the cattle had waited long for the loading, and were now in process of being brought aboard. Process primitive and painful, for both man and beast. The cattle had been driven into a fenced enclosure, out of which went a walled runway to the ship's edge. One by one, the cattle were forced along this way by yells and proddings from the men, called cowboys now, but sailors only a short while since. When an animal reached the ship, a lasso was thrown about his horns, and

thus by pulley, man-worked, he was hoisted into midair over the ship's side and lowered into the space below.

But it did not go as smoothly as these words. There was protest, compulsion, retreat, loud beast moans, and the clamoring of the men was animal sound as well, wild and primitive. And heat 113° Fahrenheit. There were no trees here to give shade and the boat became a surface of blistering paint. The heat came through shoes as though non-existent, and the natives who had no shoes, in spite of the toughness of their feet, found the boarded runway painful. They would dip pails into the river and dash the water on the planks which absorbed it rapidly and were soon as dry and scorching as before.

The men dove over into the river in their clothes, or would stoop down and drink that muddy water as did the cattle. We had been so careful to bring bottled water with us that seeing this disturbed us. We felt envious, too, of such hardiness, we who would have given almost anything for a cooling bath dared not even dip our fingers into the river for fear of a myriad diseases. We poured a little of the precious drinking water on a handkerchief and mopped our burning necks and foreheads, and felt weak and wretchedly civilized.

There was one cowboy, who, at intervals, fell off the boat into the water, his great palm hat in place, and came up with it dripping a shower bath about him. The cool drops came down for quite some minutes as he went hauling cattle. And the cattle themselves were in an agony of heat and terror. They tried so pitifully hard not to be gotten into that runway, and when one was finally forced to the end, and suddenly lifted into the air, his tongue

lolling from his half-open mouth, his eyes would bulge in his skull until they rolled up showing the bloodshot whites beneath. His forelegs bent at the knees were raised before him in a gesture of supplication. And this—fifty times, until the boat was full.

The Madama walked about, offering suggestions and issuing orders. Her face was almost purple beneath her wide straw hat, and she would repeat, "It is so difficult because of the great heat, if only the boat had gotten here in the cool of morning as intended."





18. "NÃO HÁ PURAQUÊS AQUI"

IN THIS urgency of work the Physicist and I had been forgotten. I had watched the loading of the cattle with that curious innate fear had by the "protected" when faced with the elemental, and also, I was moved with pity for these senseless, helpless beasts. Turning from them to the Physicist I asked,

"What about the eels? After all, we are not here to learn the cattle business."

I knew that I was being indignant because I could not bear any longer to see those cattle. The Physicist looked at the Madama, at the opaque waters of the river, and back at the Madama again. Our fate, like that of the beasts, rested in her hands. The Physicist began to unpack his

equipment, he rolled the wires neatly beside the generator, he loaded the moving-picture camera, he did everything slowly and carefully as was his wont; he was ready.

Now the Madama saw us, and, realizing suddenly what we were here for, came to us apologetic at her neglect. With a quick order she had a canoe out for us, and two boatmen, who knew the river well, to take us upstream to look for *puraqués*.

The boatmen looked at us and the equipment, which the Physicist was lowering so carefully into the canoe. They smiled at each other, that superior smile of those who know, and one of them said, "*Não há puraqués*," and made a motion toward the wide flood of water on every side of us. "It is the rainy season." We were beginning to resent that phrase, which we heard so continually, for it always meant that what happened was not at our will but at that of the Rain God. No matter, we would try.

We had read descriptions in the writings of early explorers, of how the *puraqués* were caught. Von Humbolt tells dramatically of how the natives drive into the eel-infested waters many horses so that these may receive the full electrical energy of the eels, until the eels themselves become exhausted. The men then pierce the tired eels with minute harpoons and pull them in to shore. A horse or two may be drowned in the process, but if the eel destruction is big enough, the natives think it worth it for they view the *puraqué* with terror. Von Humbolt took evident delight in describing a shock which he received and which kept him aching for two days afterwards; he compared its power to the then new "*Leyden jar*." This was 1800.

Francis de Castelnau describes a way he witnessed the natives catching *puraqués*. With that same tropical vine which paralyzes fish, and which the Texan is now using to such good advantage, the Indians sought the *puraqués*. They shook the root in the water, and the electric eels fell victim too, their formidable power gone. They floated on the surface of the water as harmless as a dead branch.

We had neither anæsthetic root nor harpoons for our hunting. Our equipment was the small brown box and two wires and its object was not to kill. It was an "eel caller" only, and this we named it. Its date might have been written 1937.

The "caller" was safe in the canoe, and we were ready.

One of the boatmen, a giant Negro, dipped his circular paddle into the water and eased the canoe along the side of the cattle ship, heading upstream. As the canoe made the last contact with the ship, the Madama's little maid leaned forward and without comment placed her straw hat upon the bare head of the Physicist. It had been a huge hat on the little girl, but on the Physicist it sat high on the top of his big head, and tilted up at a rakish angle which loosed his heavy dark hair and sent it spiralling across his forehead like any movie queen's. From under this seductive headgear his heavy eyebrows bristled and his stiff mustache and goatee shot forth a denial of this touch of femininity which had been pressed upon him. I doubled up with laughter, and as I went down I caught sight of an hilarious slit of black eye in the big bony face of the boatman. The Physicist, quite oblivious of his mirth-provoking appearance, gazed longingly out upon the

muddy waters and with his hand upon the handle of the generator, made ready to send forth his eel call.

"Tarzan of the electric eels!" I teased him. But he did not hear me; he was gazing so intently at the water that I thought that look would, of itself, dig up from the river bed any lounging eels.

The boatman paddled a short distance, and then, thinking that this trip was but to humor the Madama's guests (he knew damn well there were no eels!), he stopped and told us that if there were eels, they would be here. He pushed toward the shore and steadied the canoe among the marshy grass and water-lilies.

The electrode on its wire was dropped over the side of the canoe and the call sent forth. We motioned the boatmen to silence lest their voices frighten away the eels, and I sat rigid, expectant. Surely there were eels! We would evoke the mood, we in the boat would efface ourselves, we would exist only in the message which was being formulated upon the knees of the Physicist and carried down the wire into the muddy water. The Physicist sat in the far end of the canoe, that hat sitting wildly upon his head, earphones to his ears, listening intently and solemnly as he ground out from the generator on his knees the beseeching "put-put" of the electric call.

Here is when I would like to say "suddenly . . . upon the surface . . . the uplifted head of an electric eel . . . as the enticing notes of the caller . . . the waters . . . filled . . . squirming bodies . . . danger of being capsized." But, alas, this picture of particular beauty never became a reality. We sat there in the blistering sun, listening to assurances from our giant boatman, that here, at

this spot, he had seen eels so thick he could have walked across their backs. That is, had they not been electric. But not now, the waters are too high.

Proof forced us to believe him. But where were these eels now? Had they gone out to sea for breeding, as do our common eels? We did not think so, as no electric eel has ever been taken in salt water. Nor did we think that they buried themselves in the river bottom, for they must rise frequently to the surface for air. Perhaps they followed the waters so far upstream that they became lost in the surrounding jungle where no man saw them.

It was obvious that we knew nothing about the social organization of the eel nor his breeding habits, and as far as we had been able to find out no one else knew either.

The Madama had told us that two years before there had been an Englishman on Marajó, who had stayed many months, going about the rivers and streams to study the Electric Eel. She did not remember his name nor when he had left. He had been with friends of hers, but many miles away. It was odd how promptly we felt a bond toward this unknown Englishman who had been here two years back, and also a curiosity to know if he had found out things we were seeking. If he had, why then had he not told the world about it? We had found no account of his research in the journals. Of course, nature may have thwarted him in the end, the mystery of the electric eel escaping.

The Physicist pulled in his wires, the boatman sat patiently and quietly, and I heard no sound except the dimmed clamor of the cattle being loaded. Soon that

ship would be taking us back to Pará, without an eel. Every one had told us that there would be no eels, and yet, till now, I had believed that somehow we would find them. I had placed in the "eel caller" a naive faith, born of ignorance of and respect for Science. I almost believed that it might generate eels out of its electric discharge.

But, I realized after all, this is no fair test, we've hardly had a chance, a few hours only to make contact in a new language. Give us time and we would succeed. Why should we not stay until the next cattle boat returning? The Madama would give us hospitality I knew, but she had said, "There may be a returning boat in three weeks, or it might be four or six. Out here we can never tell."

Four weeks—our time would be up; six—we would have missed the freighter home. Could we take the chance? Possible ways of circumventing the time element arose in my mind, but they were vague, embryonic—and when I faced the facts, stripped of my desires, I knew that we were completely obligated to the time and place.

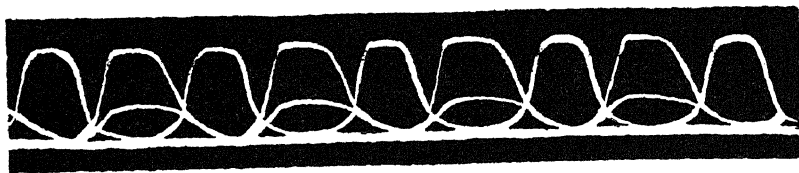
I looked at our big boatman with envy. What would not we have given to have traded obligations with him for a time? It even would be worth learning the cattle business to see what he had seen, and doubtless would see again in about three more months, "Here, at this spot, eels so thick . . ." And not only had he seen them, he had felt their shock with a cry. He had seen a steer, travelling with a herd across a low stream, stumble in the water, and heard its cry, too, in some strange fashion paralleling his. He knew immediately that the same emotion motivated each, whether it arose from man or beast—and that was fear. The steer might fall down and be drowned be-

fore the men could get him up, for they themselves have that fear, knowing there are puraqués. They can see the line of a long black body slipping between the cattle. The little calves are often lost at such times, and now and then one will die after reaching shore, the electrical shock, or fright, no one knows which, being too great. Afterwards for a time the cattle will not recross the river at this point; the men cannot force them to, but must find another way around.

Only wait a little longer. Soon the dry season will be on, and the water shrunk to a shallow depth. Then we could have our fill of puraqués. In quiet streams there would be big reddish ones, or if we wanted the smaller black ones, we had only to find some water with a rippled surface. The smaller, darker breed prefer more movement in environment.

“But, you cannot find them now. It is the rainy season. . . .”

Every statement ended thus, and we were left to squirm, knowing our impotence against the seasons. . . .



19. MARAJÓ TO MARGUARY

THE GIANT BOATMAN was inviting us to visit his family. The four-room house was near, with a clutter of children beneath it, playing there in the only spot of shade. Again all the little boys were naked and the little girls decorously dressed in one-piece shifts. There were ten, under eight years of age, five or six women, their men all working with the cattle. They evidently all lived together in this one small house, and now the men who had come over to build for the Madama would stay there too.

Twenty-five in four rooms outdid our tenements even. But here an extra hammock or a piece of floor was all a visitor needed, there was air enough for all. These children with all their lack, had a better chance of survival than the poor in our crowded cities.

The children were afraid of us, and when I tried to pick up one of them she screamed in terror. White faces were too rare not to be formidable. They had grown used to the Madama, but how did they know that we might not be cannibals, perhaps?

We did not have time for prolonged overtures, as we were being called from the ship. The fifty cattle had been got aboard, and the men now ready for the return trip.



On the boat, we found the old man and his daughter in a quiet argument. The old man was talking gently, motioning toward the heavy, dark clouds in the sky. The girl sat with lowered eyes, her lips pushed forward in a childish pout.

The Madama explained, the father was advising that they wait the night in the boatman's house. (Two more for the twenty-five!) A storm was approaching, and they had far to go; miles upstream in their small canoe. The father knew they could not make it; they would have to spend the night without shelter in the storm, as there were no houses in between. The girl sat there disconsolate and wordless. She made a gesture of impatience with her hand and looked at him reproachfully. The old man sighed, lifted her canvas bag over the boat's side into the canoe. The girl's lips descended from their pout and she arose the victor.

I remembered that I had brought a cake of soap with me. It was still unopened, lying in its flowered wrapper, white and sweetly scented. Why not for a wedding present? This fragrant bit of civilization would have glamour in the jungle. It would make the wedding night, I felt sure.

I presented it, asking the Madama to wish her from me, much happiness. The girl took the soap, raising it to her nostrils, pleased. She offered me a limp hand in return. The Madama informed me that she gave me many thanks and wished us much happiness, also. I appreciated her graciousness, though I had not noticed that she had said a word.

She and the old man got into their canoe and took their paddles; as they turned a near bend in the river, they raised

them toward us in farewell, and passed out of sight. Well, she evidently likes her cowboy, even though others say he is no good.

We too were bidding farewell to the Madama. The wild-eyed guard had come to take her and her little girl to the house where his wife and daughter waited to give what hospitality they could. There was a bottle of milk for us, real cow's milk, freshly boiled. We could not drink what they gave us in the hotel at Belém, so this was a nostalgic beverage to us. With the taste of it upon my tongue I returned home three thousand miles upon the instant, and to the memory of warm milk, foaming in the pails, black hands pulling the brown udders of patient cows. My childhood world and this run in strange parallels at times.

The evening was falling still and beautiful, for the black clouds had not yet released their burden. We lay on the roof again, so tired we felt as though we had loaded each of those fifty cattle. The men who had really done the work were still at it, prodding them with foot and stick. They must be turned properly, their heads pushed low and tied in place. A steer fell down, and the others walked upon him, their sharp hoofs digging painfully into the soft fleshy body. Their line of living was nearly ended, a few more days and then the slaughterhouse, refrigeration, shipment—England, Spain, the United States. All their freedom and protection on the island, but to one purpose—to fill some mortals' bellies.

As I looked up from their close bodies, I saw upon the shore at the river's edge, a zebu bull. He had come down to drink, and startled by the unaccustomed noise of our

ship's motor, had suddenly drawn up his head, blowing, from his wide nostrils, the water in a spray about him. He had vitality and dignity of every line, from the wide forehead and upward mounting horn spread down the loose, rippling flesh about the neck, past the fine, delicate legs, to the clean hoofs, lost in the grasses.

Magnificent and free, this one, and forever. His job but to supply the sperm to countless willing cows. He had been brought here recently to improve the stock, and there were stronger calves already. Man seems to show intelligence except in his own simian breeding. Looking from this animal to us upon the boat, I wondered, how really we had become the dominant species. The evolutionists will tell you, it was because our ancestors had independently articulated thumbs; the fundamentalists, because God put a soul into Adam.

This is for the scientists and religious mystics to unravel, my job is to use my eyes—to see the obvious so wholly that I might also surmise the hidden, or some little part of it. It is simpler to come back to what is before me; observe the trees growing thick upon the banks. There is not one whose name I could have told just two weeks back, but by now I know many. I was surprised to see one now and again, standing stark and leafless among others which were crowded with thick greenness. They did not look dead, as they were too full in their branching. We were told that there would be new leaves soon. Some trees here in the tropics dropped their leaves slowly and intermittently, and so are always leafed. Others, like the ones we thought were dead, would drop all their leaves at once, as though a sudden arctic cold had touched them,

but in a week another covering would be full upon them.

We passed near a huge rubber tree, only partially alive and scant in foliage. It was festooned with nests as a Christmas tree is with bright balls. All the nests were pendent and of two sorts, cassiques and hornets. It is always so, for here the cassiques and hornets have established a tolerance one toward the other. The hornets do not harm the cassiques and the birds find the fierce insects a protection to them. They will always seek a tree inhabited by hornets, and there build in colonies their swinging nests.

Suddenly one of the drowsing sailors jumped up with a cry, and running toward the stern, pulled down from under the awning a gun which we had not even known was there. It was ancient and looked rusty, too, but the man put it to his shoulder quickly, aiming toward a tree, in which I saw nothing save a thickness of green leaves. He fired, and the tree seemed to rise on bird wings in a blur of red. There were sharp cries. The tree had been full of scarlet ibises. The man who had fired leaped quickly into a canoe another had unloosed, and sped toward the tree. Underneath, floating upon the water was a limp bird's body. This he grabbed and held up by the long neck. It was soft brown and white in color. I remembered the low flight, and the sound of their beating wings in the dusk of the night before.

"Another chicken for the pot," said the Physicist. And it might just as easily have been a scarlet ibis.

The hot air fell once more upon us, flat and heavy, and the stillness of the grass and trees communicated to us their intense expectancy of the coming storm. For the mo-

ment the earth about us seemed to be held in a gigantic glass ball, from which all movement was excluded. The slight ripple which our boat left upon the water was the sole exception.

The sky became a blackness, and the glass ball was splintered by the rain, coming fast and hard. Too much this time to hover under a piece of sail. We went below, and lay as we were, fully dressed upon the bunks. On the other side of the partition we could hear the cattle stamping futilely and moaning. The smell of them came through the cracks in the latticed window, and our stomachs fairly turned within us. The chiggers I had collected on shore that day had formed in two hot and raging colonies beneath my knees, and the sunburn on my face was a burning pain.

I fell into a sort of stupid sleep in which there was no rest of either mind or body. All the sights and happenings of the last day and night were hard upon me, out of all proportion. One moment I was being trampled by the cattle or thrown, torn upon that pole on which the hide had hung. Again I was in terror, having somehow gotten lost upon the island, and I was clinging to a dead tree as the waters mounted round me. (Thinking of the dream next day, I remembered having seen that dead tree, like a human trunk with stubs of amputated limbs thrown stark against the sky.) Next I was on the roof of the engine room as the boat slid under a near tree. The overhanging branches came toward me swiftly, scratching against the boat's side, and catching me in their midst, brushed me from the ship, and sent me falling endlessly until I struck the river.

I awoke, crying out, and found myself still in that narrow bunk trembling in a hot sweat. There was a high piercing cry beating across my startled senses. The Physicist, too, had awakened, and arose and put on the light. His big form completely filled the little space beside the bunks. "Let's get on deck," he said. He lifted me down from the upper bunk, and we felt our way out on the dimly lighted deck. It was still raining, but gently now and the cool drops felt good upon our faces. I wondered if the Physicist had heard that high cry. But he did not mention it, and now, thinking that it might have been part of that painful dreaming, I said nothing.

The boat was tied up to a dock upon which a few forms moved in the dim night. Two of them were women, big dark ones, pouring some liquid from jugs into gourds which the men held out. A man carrying a suitcase passed by them, spoke to the captain and got aboard. He was dressed in city costume, white suit and small straw hat. We arose to let him by and, with a polite lift of his hat, he passed us and entered the only other stateroom. We concluded he was another passenger. Now with the Madama gone and only Portuguese spoken on board we were not too sure of anything.

It was only twelve o'clock, though it seemed to me that I had been in that state of half-sleep many nights. It felt better being outside, so we sat there in the rain, wondering where we were, and when, if ever, we would reach that foreign city we now were calling home. We got out some dry crackers, offered them to the other passenger and what crew were near, and drank some of our bottled water. The rain began to come so hard that we were

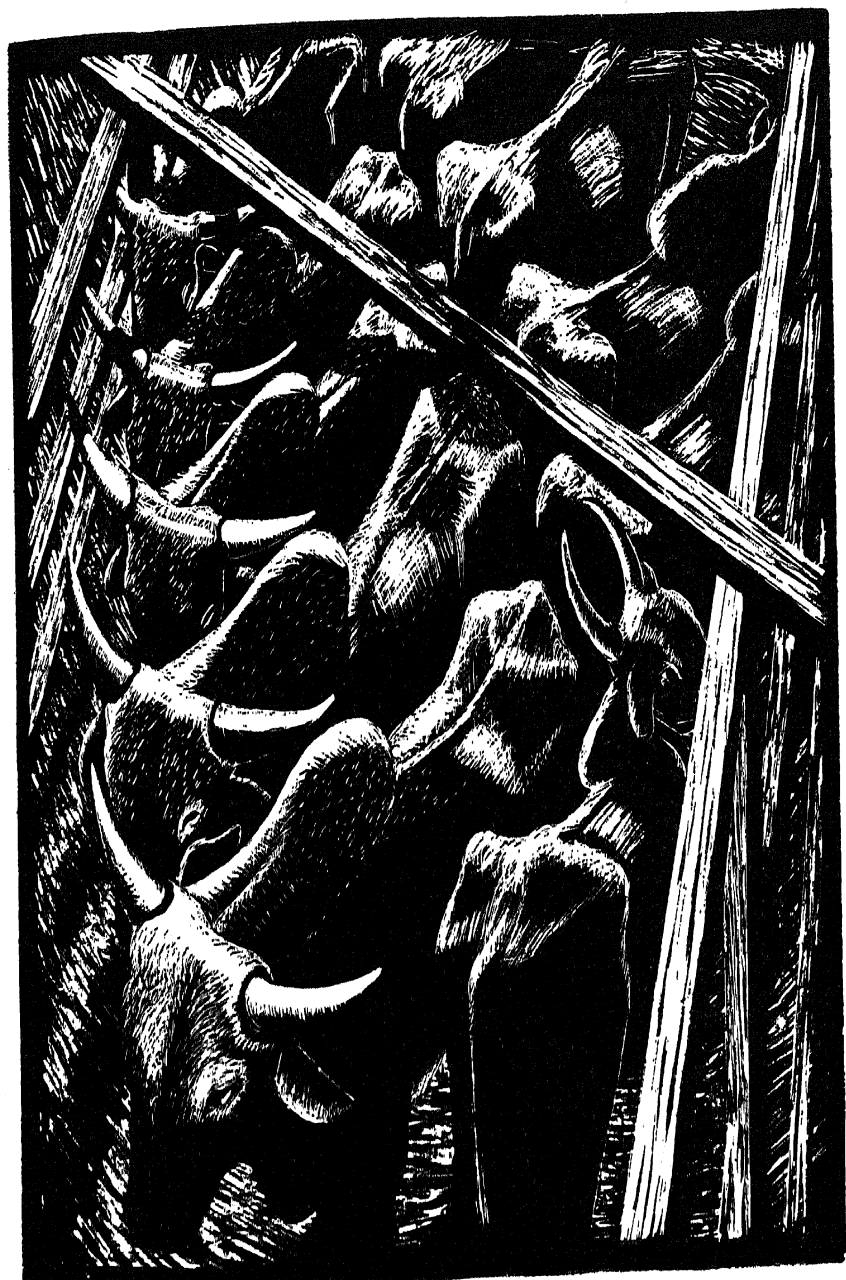
forced to go below and crawl up on those blistering bunks. Sheer exhaustion this time brought me sleep.

A horizontal shaft of sunlight coming through our porthole awoke us and we looked into a clear sky. The boat was still, which meant we had reached Pará, perhaps. But outside we saw no city, only a dock at the foot of a tall hill, with the angles of a derrick sprawling high, and a sign halfway up the hill, saying, "Marguary."

The crew were making preparations, apparently for unloading the cattle. Those which had fallen down in the night were being got on foot. But one of these would not respond to proddings. It was lassoed at last and hauled up dead. The heat and terror had been too great for him.

Now again I heard that sharp cry of the night before, but in the full day it did not terrify; rather it had a familiar, homely sound. I went toward it and peering through the loose covering over the cattle space, saw down below three new animals. Two men of the crew were tying the legs of one of these for delivery up above, and he was emitting his most piercing squeal! "Pigs," I said and laughed, somewhat ashamed, remembering the cold sweat that had covered me.

We left the ship now to see the pens full of a thousand cattle from the near country and the far Amazon as well. We walked the narrow runway above the heads of the cattle to look down upon them. A slowly undulating surface of soft hides shoved together as close as space would allow. The sunlight fell slantwise over them at this early hour, making every ridge of backbone and sharp hip stand out clear and hard. The bright spots shone white or tan or iridescent black. The shadow pockets were dark



holes into which even the color of the hides was lost. The curves of the wide-spreading horns played like a repeated motif above the light and shadow of the body masses.

Our attention was called to the two most prized sections of the pens. One of these contained gray-white zebus, whose progenitors had been imported from India. Their great lumps of fat above the shoulder blades rose like a conventional wave scroll in an Indian painting. The occupants of the other pen were as great a contrast as you would hope to find among animals so closely related. Native water buffaloes from the far Amazon. They were broad-backed, broad-headed and their crinkled horns stretched wide on a horizontal plane. Their coal-black hides were smooth and shiny. These water buffalo maintained a certain aloofness on a cattle ranch and would not mate with the domesticated stock as did the Indian zebu. Here was a case of the black being the "discriminating race."

Back to *Major Barata* and by noon Belém. At the hotel the Biologist was lunching. His hands were better, he assured us, and we, feeling that we had no further cause to be anxious for him, gave ourselves over to our own fatigue. We fell upon our beds and slept till evening.

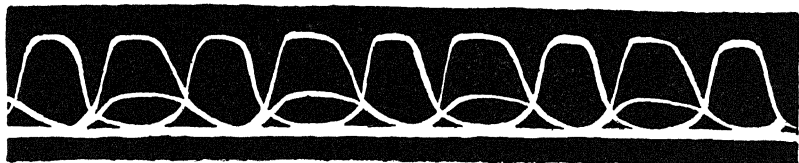
When we awoke the night was approaching, and the tall-windowed room taking upon its soft blue walls the red and yellow glow of sunset, reflection of wide sky suffusing each plain object of bed or chair or table. All sunsets, not even here, look quite like this. It touches those illimitable reaches which painters seldom dare attempt, and when they do, God help them! It is a sight to look on only,



and remember suddenly in some other time, when in need of beauty.

The gold, the red, the changing blues, are fading now, the black cannon thrusts of rain clouds are gathering. The vultures, risen from the roof tops or from their gleamings in the narrow lanes which pass for streets, are circling—now sharp black against a sun shaft, or becoming one in color with the rain clouds. They will be wet tonight, but early on the morrow they will take up their stations on the roof tops, and sitting motionless with upraised wings allow the sun to dry them off. In this time of suspended motion dignity of line is theirs and beauty too. What if their restless eyes are searching carrion in the streets? Their social organization has not yet produced its butchers, chefs and butlers.

We, being more fortunate, go down to dinner.



20. POLITICO

THAT NIGHT the dining room was a swivet of hushed excitement. The Brazilian Ambassador to the United States of America and his military staff had stopped in Pará en route from Rio to the U. S. A. Since there was to be a presidential election in two years, the provinces became important politically as well as geographically, and at this time a visit did not go amiss. Had the Ambassador and his staff been picked for their appearance only to impress the people, Brazil hardly could have made a better choice. These men were tall, well built and extremely handsome. They had no counterpart in Pará, where the male populace is small of stature, and where the good looks go to the women. Southern Brazil breeds a bigger people, and the Amazonian brother might be of another race, there is so great a contrast.

The head waiter of the Grande Hotel was in an ecstasy of delight. The aroma of Rio, which he so loved, still clung to this entourage, the bright lights of that city shone in their eyes, efficiency was about them. The head waiter moves so swiftly his slight limp is no longer noticeable. There is a high color in his cheeks and the pained lines about his mouth have changed. Santa Maria, this is living!

These are the people worthy of his service. Bring on the turtle, bring on the hearts of palms, bring on the wines, and for this once, the best Brazilian coffee!

The Ambassador had just witnessed a unique occurrence—a President of the United States of America greeting, on Brazilian soil, a President of the United States of Brazil. That variable, international relations, for this moment, was permitting the republics of the Western Hemisphere to speak in warm and friendly tones. Never since Bolivar, who wore a medallion of Washington upon his chest, had there been such ideas of good to be exchanged and shared between the two peoples.

The cordiality of the American President was returned in kind, and the beautiful city of Rio was gay in his honor. The Ambassador had been temporarily recalled from Washington to assist the Brazilian President on this important occasion and the successful beginning of better Pan-American relations had brought him satisfaction. For the first time Brazilians might think of Americans in terms of friendship not entirely conditioned by the momentary, and often hazardous, dealings between individuals. Goodwill between governments inevitably brings the people closer to one another in mutual confidence—in a sense, granting them the right to like each other.

The Ambassador was glad to hear that there were American scientists working at the Museu Goeldi, and the following day he found time to visit them. He and his staff arrived unheralded and precipitated a mild but complete agitation throughout the Gardens. The already clean paths suddenly swarmed with workers in an orgy of devotion to their brooms and rakes. The guard at the gates

stood at an attention which must have been very painful to him, it was so unaccustomed. Work for the morning was suspended automatically. The gentlemen workers in white coats peered discreetly from the windows of their rooms, while the Zoologist showed the guests about the place with the same courtesy he extended to all visitors, but silently hoping they would see fit to mention in Rio how much the Gardens needed a new building to house the fine but overcrowded collections in the museum.

They entered the laboratory just as the scientists were concluding an experiment upon an eel. The effort of concentration necessary for the use of delicate instruments for the observation of the behavior of the eel, and the flash on the oscillograph had caused the very atmosphere of the room to tighten, almost to become of a tangible substance which excluded the outer world. The scientists, with sleeves rolled up, hands thrust into rubber gloves, hair disordered, were oblivious of themselves and the apparent confusion surrounding them. There were blood and sections of eel upon the table, there was blood on the rubber gloves of the scientists, and a general air of carnage about the place. The Ambassador and his military staff step in, suave, immaculate, aloof. Their clothes are very white and there is an aseptic quality about them which is startling against the background of the unclean laboratory. They move carefully between the operating table and the bloody cheesecloth rags dropped hastily upon the floor. The Ambassador is full of polite inquiry and compliments. The military staff is attentive. The visit is a charming social occasion. The gentlemen are even handsomer upon closer view, and their manners are perfection.

The whole life of the Gardens had risen to a higher pitch. Bring on the jaguars! Bring on the rhea and the timid deer! Let the boa constrictor be fed, and have the electric eels turn on the lights! A leader of the people has come to see!

It was over very quickly. The leaders had moved through the midst of the people, lending to them for a moment some of their sovereignty. The workers exchange comments full of admiration for their southern brothers and seem themselves to grow in stature as they think on them.

The ancient little worker again put on his remnant of a hat, the guard at the gate had made his last salute. The life of the Gardens fell to its normal tempo—externally, at any rate.

The leaders of the people had moved through their midst. . . .

Would there, perchance, be other things than the explanation of the functioning of the electric eel, or the construction of an atom, or of nerve tissue and so on, on which a scientist might talk to an ambassador? What the results of scientific findings ultimately do to mankind is rightfully the concern of both and should be a fertile field of contact. They could agree, as a starting-point, that modern civilization is built on scientific findings, from the brass buttons on the coats of the military staff to the airplane which brought the Ambassador here. Unfortunately the effects have not all been turned to so decorative or peaceful an end as buttons and travel planes. Scientists have provided the world with the knowledge to create poison gas and guns and all the other modern contraptions which

governments and military men hand over to the people with which to kill each other. At times the scientist himself is directly responsible for these results; there was one such, a Roman Catholic priest, as well, "a man of God" who invented a poison gas, which, during the World War proved most effective. It left bodies upon the earth, distorted into a seeming motion, but still and livid. (In death let us preserve the aspect of life, for it is sacred.) This man accepted an award of honor for this particular work, but he did not go out afterwards, like Judas, and hang himself.

Forgetting the Roman Catholic priest, if you can, the average scientist is wholly innocent of the applications of his findings.* As a creative being he is absorbed in the process through which is coming forth a new truth, a way of explaining some phenomenon of nature. And when he has it, whole and living, it goes from him and becomes the property of any man to use as he will. He cannot possess what he brings to life; but scientists, taking full cognizance of their power, might consider, not only that they have a right to know what their findings are to be turned into, but—and here is the arrowhead—that they are obligated to as well.

The pure scientist is a man of peace. He does not profit by chaos, but as in the abstract world of physics, where from order he derives order, so in the world of man he must have peace to free him for that state of receptivity which is essential to the discovery of scientific truths. Should he not, therefore, now existing in a world grown

*With the madness of the war which has broken since 1937 and the part which scientists are willingly taking in its furtherance, this appears a misstatement, though in more rational times of peace, it is not.

out of scientific findings, feel that he has a right to say what further happens to mankind? And seeing himself in this relation to the world, should he not work toward a peaceful means of accomplishing its betterment and setting man free to know only the benefits of science? Should not he and the leaders of the people get together on this matter?

I ask this question of the Physicist, and then—does the artist come into this picture at all? The musician? The poet? Is not the æsthete more closely related to this picture of the pure scientist than any other man? How about consulting him as to what happens to mankind? So far, the artist is considered of importance only in his specialized field and in his life time, if he is fortunate, will receive the acclaim of the people by his ability to arouse in them their own powers of perception and feeling. By transferring to them a part of his emotion as it has been set off by the pulse-beat of the physical or emotional life by which he is surrounded, he brings to them the realization of a world beyond the getting and spending. A world as necessary to the survival of the human species as the bread they eat. "Man cannot live by bread alone" carries not only a spiritual significance, but is so practical a statement that it might be taken as a suggestion for the cure of our material ills. If it were put into practice it would so change the standard of man's ambitions that there would automatically be left in common enough of the world's resources to supply the physical needs of all its people.

And, seemingly forever, people are faced by the paradoxes of their own natures. They may not want to be reminded that there is anything beyond themselves, and

there are instances when they turn upon the artist for this reason, and if he transgresses the conventional standard of what art should be, he is in danger. Actual physical danger; Van Gogh was stoned . . . and yet artistic creations as well as scientific theories outlive all the political intrigues, social and religious prejudices, and personal meannesses of the age through which the individual discoverer must struggle. It is easy enough now to look back upon the ages and see that Galileo was of far more value to the world than the Pope who by threatening to excommunicate him placed his soul in jeopardy, that the only man worth saving from the decadence of the court of Charles IV of Spain was Goya. And I, for one, do not believe that the loss of da Vinci's "Leda" was worth all the fury and reform of Savonarola. Dante, fortunately born, had a part in the government of Florence. But he was too advanced. It was easier to get rid of him than to improve the lot of the masses and Dante died in exile. Florence could then safely clamor for his ashes—after all, Dante was a great writer.

True, there are times of social upheaval when scientists and even artists are called to a particular service of their country. Leonardo da Vinci, living in an age and country particularly tumultuous, contributed designs for the reorganization on a sanitary basis of plague-ridden Milan. He was also engineer to Cæsar Borgia in his military campaigns, but declared war to be "a bestial frenzy," and was always driven from one patron to another by the political forays which continually destroyed all security of living. But he is among the exceptions. The creative man of the arts and sciences is not generally expected to be of impor-

tance, or even of use, in the organization and workings of the everyday life of the everyday man.

This organization rests in the hands of men who receive their authority by heredity or economic superiority, or who have attained it by methods which at best are calculated to arouse in them a disregard for, and frequently scorn of, the needs and desires of the people. At worst it turns them into dictators, so filled with their own egos (which they see in the guise of an ideal for saving the people from themselves), that the individual becomes robbed of all personal rights, and becomes no more than a cog in the machinery thus set in motion. And, according to history, eventually that machinery becomes inevitably the machinery of war, man but an instrument of death for his fellow man.

Here an exception must be made to the men who plan for their fellow men, but who are conscious that their authority is at the will of the people. But in a world where the people had the art of living well, "rulers" of the first category would be utterly superfluous, having nothing, inherently, to contribute to that world. Just a minute—a few might be maintained who had a particularly good sense of the dramatic, so that they might perpetuate the pageantry of parades, presentations, garden parties (though not so exclusive), or who might, upon occasion, mount a balcony and yell loud enough to relieve the suppressed emotions of a simian world which has individually foregone the right of screeching from the treetops. But these "rulers" would have no power. They would be of use, like any theatre. They might even, upon occasion, be considered artists. . . .

The scientists and I had been putting the laboratory in order, each silent under his own thoughts. Continuing mine, I put a question to the Physicist.

“What really do politicians contribute to society, or perhaps I should say—to social man? It seems to me that they belong in the same category as the gold standard—a purely artificial assumption of usefulness. Our economists have used gold as a symbol of the wealth or poverty of a people but its inherent usefulness is of so little importance that the best thing which governments can find to do with it is to bury it in the ground, where it lies unproductive of anything but greed. The same society has produced the politician also, and in a sense they are both symptoms of the general inefficiency of ‘civilization.’”

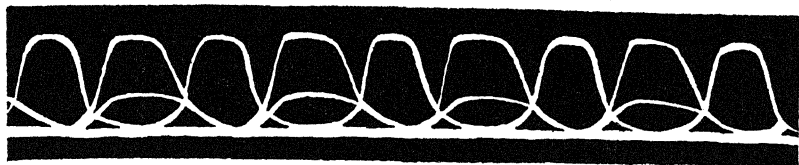
“Well,” said the Physicist, “perhaps civilized man is at the end of his evolutionary road. According to Veblen, primitive and prehistoric man belonged to a different breed from historic and civilized man. Primitive man was peaceful, not individualized, conscious of himself more as a member of the tribe than as a person, not concerned with whether he had one soul or shared his soul with many. Also he was indolent and incurious. The beginning of history was the emergence of a new biological type, individualized, aggressive, competitive, with a strong will to dominate others and the forces of nature. The latter trait was necessary for the development of science. But now that the knowledge of nature has created a technical and complex civilization, the traits of civilized man which brought about the development of science are no longer traits favoring survival. The future belongs to another variety, more cooperative and less aggressive—less indi-

vidualized. The traits of civilized man which unfit him for life in civilized society will have to be bred out by a long evolutionary process. Man must become a new creature. He must be born again and again for hundreds of generations. . . . What do you think about it?"

"He may be right or perhaps the social organization is at fault, and it is our obligation to change it. And what do you think?" I said, turning to the Biologist.

But the Biologist was not there. He was outside in the sunlight, fondling Chico.





21. EEL DATA

WE WERE at a point now, where we would, like Joshua, have the power to produce a timeless background (not to give men more time to kill each other, but), to arrive at an adequate explanation of the phenomenon of the electric eel. The necessity of calculating against a span of time and ordering our movements within its limits was bringing to the work in the laboratory an urgency which put a tension upon us all. And as this span contracted with a rapidity seemingly out of all proportion to the actual physical passage of the days, the usual quiet of the Physicist became accentuated to a degree where verbal communication between us almost ceased. I would sit useless, waiting to comply with some short request made by the motion of a hand toward a needed object, or I would put on the rubber gloves so that I might hold the eel on the trough and give it the necessary proddings to stimulate the production of a discharge. It seemed to me that there would never be an end to this repetition, but again, there must be no mistake. The findings must be so complete that the explanation might be presented in a hieroglyph, which, though meaningless to the uninitiated, carries a truth to the scientist which is completely satisfying.

Any interruption became an irritant as well, and for the first time the wide doors were closed against chance visitors. The Zoologist shook his wise gray head at us, saying, "Working, always working. . . ." Our behavior did not belong to the tradition of the tropics and he doubted its expediency. Nevertheless, the doors were shut and the oscillograph was bright with the dancing green curves.

The supply of eels had diminished to less than half the original twenty and even the very little ones were being called into service. There was an eight-inch baby up for observation now. We kept it in a small glass tank where it moved with the slow fluid movement of its kind, beautiful to watch. We gave it a pet name, and always reserved the daintiest bits of meat for its dinner. The little gourmand would eat so hugely that the first fifth of it would swell to an extent making the tail so relatively long and thin that the creature looked like a gigantic tadpole. He looked so entirely innocent, too, that I became careless in the handling of him and was repaid by getting the only electric shock I received during the whole experience of laboratory work, and it was amazing what a jolt that tiny thing would give!

"One hundred and twenty volts!" said the Physicist, measuring his discharge. "Not bad for a baby!"

"How does it happen that so small an eel can develop a voltage of that amount and that one measuring four feet develops only some four hundred volts—which is relatively small?"

"We're not sure about that as yet. I think it's partly, at least, because the discharge runs down the body of the

eel like a wave. The voltage in every part of the organ rises to a peak and then falls, but not exactly at the same time in every part. So in the front part of the organ the voltage may be past the peak and falling while at the tail end it is still rising toward the peak. Because of this, the peak voltage between the two ends of the organ is never the sum of the peak voltages in the parts, but always less. All our experiments have shown this.

"The wave runs along the organ at about a thousand yards a second, or something like it. In our longer eels the large electric organ is about a yard long. So the wave needs about one thousandth of a second to run from end to end. This is half the length of time that the discharge is maintained at any one place along the organ. The largest eels found are certainly twice as long as these. If the wave travels no faster along their organs, then the discharge will be all over at the front end of the organ before it so much as starts at the tail end. And if the eel keeps on growing, he gets no extra voltage for his extra length. He will have a greater need of food without having a proportionate increase in his ability to capture it. This is what is called 'The Curse of Bigness.' The long eel gets hungry, and I crack my head on the ceiling of the Pará street cars."

"I don't think it's quite so simple," he ended. "We ought to have a lot more observations."

"I'll carry the movie camera whenever we ride on the street car," I answered, "and take pictures every time you crack your head. It's too bad we haven't a sound track."

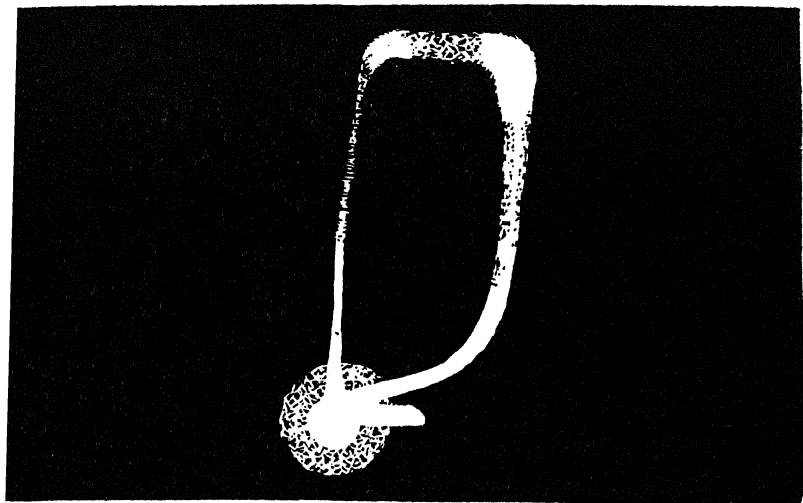
The Physicist drew himself up to his full six feet three and one half inches. "I was discussing research on pur-

aqués," he said sternly, "and just for that you have to help hold them."

The Physicist takes from the tub one of our few remaining eels of size. He is healthy, squirming vigorously as he is seized. He drips a trail of water across the room from the tub to the laboratory table and from his body flow long thin tendrils of slime. It is with difficulty that he is adjusted to the narrow length of the experimental trough, slipping disconcertingly under the rubber-gloved hands, and protesting with lashings of his tail. Pushed into the angle of the trough, however, he becomes suddenly as inanimate as the wooden material against which he lies. Look as closely as you will, no slight movement can be detected the entire length of the body. The small cloudy eyes are completely expressionless; the mouth is shut; the lone fin beneath the body from head to tail is limp against the board; even the breathing seems to cause no pulsation in the cramped body space. His appearance is death. But adjust the wires from the oscillograph and the green lines are there, dancing swiftly to denote that the electric current is moving in waves we cannot see down the length of this motionless body. The voltage between head and tail is measured, and the figure is set down.

Then the voltage is measured over every ten centimeters of length. The sum is more than the voltage between head and tail. The Physicist has done this many times with the same results. It is safe, therefore, to conclude that the discharge is a surge, a pulse running along the electric organ. And I, as an audience with the facts before me, am convinced of this.

The Physicist adjusts the wires in another fashion and



a new figure appears on the window of the oscillograph—a loop, mounting almost vertically on the first trace, curving gradually across and down and then dropping swiftly and turning almost to the horizontal as it meets the starting point. I had watched this figure many times before and I had photographed it; now I enquired its meaning.

“The experiment is much the same as the other, though the trace is so different. Each of them measures the speed of the electric pulse along the organ. In the first method the voltage of the whole organ is used to cause the vertical motion on the oscillograph, while the sweep circuit inside makes the horizontal motion for timing. Here half the voltage is used for the vertical motion and half for the horizontal. The hind part of the organ serves as the timing circuit for the front part. This straight vertical side of the trace shows the lead of the discharge in the front segment and the sloping return trace here shows the lag

of the discharge in the hind end. It's an old electrical engineering trick.

"The speed comes out the same either way, about a thousand meters a second. Such a speed is puzzling. As against the speed of a surge on a simple electric line, which approaches that of light, it is low. But for a physiological speed it is high. The highest known speeds of the impulses that run along nerves to convey sensation or stimulate motion are around one hundred meters per second, but one tenth of that of the electric eel, and these are in the nerves of mammals. The speeds of nervous impulses in cold-blooded animals are generally much less. The speeds of diffusion of chemical substances are far lower than this.

"Do the nerves of the eel transmit impulses so much faster than the nerves of any other animal, or does he have some special adaptation which enables the stimulus to be held back in one part of the organ until the message has travelled the length of the whole, as if the message to the head end said, 'Make ready to discharge at such and such a time,' allowing for the impulse almost to reach the tail in that time. Or does the stimulus travel in the nerve at all? Perhaps it simply passes from point to point along the organ, the discharge at one point triggering off the discharge at the point next farther down. In the laboratory this device is used for producing high voltages for atomic disintegration. It would be strange if the electric eel has been using it for who knows how many millennia."

This conjecture at least can be tested, though it will mean the sacrifice of an eel. The Biologist cuts the inanimate body of the eel almost in two, completely transecting the electric organ. The green trace on the oscillograph

does not alter. Next, the spinal cord is severed. Now the part of the organ ahead of the cut develops its voltage as before, but the part behind does not. It is not dead but the communication between it and the head has been broken. The stimulus then is carried by the nervous tissue of the spinal cord.

The experimental table, when sharp instruments were invading living tissue, I had not liked. I did not like it yet, but nearly at the end of this three-months' apprenticeship to science I could view it with less sense of withdrawal. Out of destruction comes creation. Nature is continually breaking down one form to create from it others. And the scientist may destroy his material to learn its composition and from this knowledge build other forms. In this case the material is the electric eel. Will it be possible to gain from him an explanation of the functioning of the nervous impulses of human beings? As yet we do not know but can only proceed from one finding to another.

The Physicist speculates—if the eel has nerves which carry impulses ten times or more faster than the nerves of all other animals—how does it happen that he alone has evolved thus? A high speed of nervous impulse would be an advantage to many large creatures. The dinosaurs were hindered by the slow communication between their little brains and the outlying posts of their empire. One species was so much embarrassed that it made an early experiment in decentralized government by evolving an auxiliary part-brain, located toward the posterior end of the creature, to govern its hind quarters, much as the mediæval monarchs established lords of the marches or barons of the “Cinque ports” with almost royal authority to

make decisions in emergencies. One wonders if rebel desires awoke now and then in the posterior brain, causing the animal to embark upon a campaign of complete frustration. . . . But—return now to the eel and the evolution of his electric organs.

The changing of his muscle into electric tissue has been to him an advantage, but he has lost certain other abilities in the process. He has a greater weight to move in swimming and ordinarily he swims only by tiny muscles which send a rippling wave along the under fin and give him a slow motion through the water. The optic nerve, the Biologist has found, is slight. His teeth are so small that the earlier naturalists said he had none. He must swallow his prey whole and keep it helpless with his electric shock while he swallows it.

How has it happened that the electric eel and the few other species of electric fish are the only species to have developed this power? There is the electric catfish of the Nile which has evolved electric tissue from glandular material under its skin and is sheathed with an electric battery. There is the torpedo, a marine fish, near kin to the skates, which has electric organs in its wide lobes, short in the direction of the voltage, but wide enough to pass a large electric current through the highly conducting sea water. There is the African mormyrid, elongate like the electric eel, suitable to its fresh-water habitat, of whose habits little is known because no one has ever been able to keep it alive and captive. By some strange cause it has developed a polarity opposite to that of the *puraqué* and its head is negative. To accomplish this, each unit of the electric organ is pierced for the passage of the nerve

which comes down to the hind face of the unit, passes through, and is attached to the front face. What could be the reason for this difference? Then there is the star-gazer, strangest perhaps of all electric fish, that is found rarely on the North American Atlantic Coast as far north as Chesapeake Bay. This fish has evolved its electric tissue from the muscles which moved the eyes of its ancestors, and now their descendants have eyes cocked perpetually heavenward.

No two of these fishes belong to the same family. Only after thought would one choose five fish having so little in common.

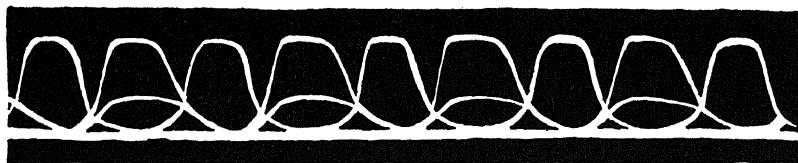
And in every case, unless perhaps the electric catfish, the electric tissue has evolved from some organ which other fish have and find useful, upon the possession of which the life of the fish may depend. The electric tissue has not grown out of an organ; a part of an organ has not been differentiated to form the electric organ, but the whole organ has had its function entirely changed.

Why, we wonder, has this occurred? If the organ was more valuable as muscle or as gland, why did it not remain muscle and gland in all species? If it was more valuable as electric tissue, why did it not change over in all species? Why has not nature in all these millions of years evolved its best design and stuck to it? And then we pull ourselves up short. We have slipped from the rationality of science to the dogmatism of modern business. The business dogma says we will build a better mouse trap than any one else and the world (with some help from a good sales force and a smart staff of copy-writers) will make a beaten track to our door. And the track will be a

hour's walk shows a score of species of butterfly, where on every tree trunk there are so many leaves of liana and little plants sprouting in the crotches of the bark that one searches to find the leaf of the tree itself, where the cassiques and the wasps nest in the same trees and flourish because they are different, not because they are alike, here it is easier to remember that the adaptation of a species is its adaptation to its environment of other species so that evolution works toward a balanced community of varied types rather than to the conformity of all creatures to one type. Here we can pull ourselves out of the business dogma, as a man may with effort waken himself from a bad dream and see clearly its fallacy. Man, or the type of man held up as a model by the business dogma, man under the sway of the idea of domination, is fast on the way to self-destruction. He has already cleared the forests, burned the grass, shot the buffalo and the heath hen; he is not blessed even with the providence of the electric eel who stuns his prey only, so that what is not actually consumed revives. The *puraqué* does not destroy tomorrow's meal.

Man can fall back a long way, though unfortunately not all the way—not back to the Garden of Eden. On the other hand, can he stand indefinitely the test of survival of his present form of supremacy?

Not only might he consider the lilies of the field but the cockroaches, which he exterminates, and to which he is but an evolutionary parvenu.



22. "ALWAYS COW"

LEAVING THE laboratory we waited in the noon heat on the Avenida Nazareth for the street car. It came, at last, the rear of it overcrowded as always, and we mounted, shoving our way as best we could toward the half-empty front. This disproportionate crowding puzzled me until I learned that soldiers, policemen, city employees, etc., etc., could all ride free if they stood on the rear platform. And the rear platform always spilled over into half the car! We pushed forward and found seats in plenty. A furious clang from the motorman and my thoughts fell away before the sight in front of me. The tram car had met a zebu. He was a beautiful beast, hitched to a rickety wagon full of fruits and vegetables, and completely oblivious of fulfilling any menial task. His owner was in front, pulling and yelling unremittingly but he would not be hastened. With ponderous dignity he moved slowly across the tracks and the wagon bumped rhythmically after.

"That," said the Physicist, "is as it should be. Why should the sacred beast of India fly before a clattering tram car?"

Where other place a city which can show us oxen and

street cars vying for the right of way? And the ox knowing neither the right nor left can go where his stubborn will dictates. The driver resumed his way when he could and, to appease his anger at thus being halted, sent the street car jolting wildly down the avenue and, with a terrific show of control, drew up so quickly in front of the Grande Hotel that he all but precipitated us headlong into the street.

As we were collecting our disrupted senses, we saw in front of us the Captain—the one who was looking for a quiet place—going now, red-faced and hurrying, toward the bar of the Grande Hotel. We hailed him and with his customary hospitality he pulled us in with him, insisting that we join him in his favorite punch. He gave his order and then settled back into the coolest corner, loosening as many buttons of his tight uniform as the dignity of Captain permitted. The heat at this hour was the highest of the day and even the bar was almost deserted. We were glad beyond words to see the Captain and he us, and we sat about the table like friends united after half a lifetime. He was bursting with talk, pulling out of his pockets photographs to show us. Then, feeling that his audience was not big enough, sent the Physicist in search of the Biologist.

The Captain continued thumbing through his photographs and paused before one of a large whale stretched upon a beach.

“There’s a story about that whale,” he said and paused. “Sometime I’ll tell the Doctor and he’ll tell you.”

The tone clearly implied it had to do with sex. I felt adolescent, and began to wonder what was the untellable

began gathering up his photographs, and bowing gallantly and frigidly to the new arrivals, he made a quick retreat. I turned toward the cause and saw the Ship's Doctor and one of its passengers, a charming elderly lady from Kentucky. I had liked them both and greeted them with interest—curious, too, to have further news of the other passengers and the trip south which the ship had made after leaving us in Pará.

Just what happens to Northerners when they reach the tropics, I do not know, but it is generally conceded that they go "amuck," meaning that they lose all self-control and behave in a manner entirely unworthy of their finer natures developed in the north. It may be illuminating to know that the word comes from "amok"—"a nervous malady of the Malays, marked by a murderous frenzy." But, I assure you, the disease is frequently developed in the north, and is no less virulent because of it. It attacked the thirteen passengers on the ship just two days out of Philadelphia, and by the time we reached Pará there should have been a red flag flying from the mast: Some day I want to write the story of that trip, but it will be possible only if I outlive the entire lot, passengers, officers, and crew, and because the truth of it is so unbelievable and fantastic, I have all the necessary notes, so that when the time comes, I will be able to persuade myself and my possible publisher that I have not gone altogether mad in my old age.

For the time being, all that I can say is that we were very thankful to be staying at the first port of call, and not making the round trip, New York—Bahia. That we should, however, follow the course of the ship as it con-

tinued south and returned to Pará one month later and be eager to greet the infected inmates is to me now inexplicable. But that element, curiosity, never lets us be and, also, we believed that these people were not really responsible for their ailment and that in their normal living, the majority of them, at least, were quiet average people. We liked them—that is, most of them.

As I was talking to the Doctor and the Kentucky lady the Physicist returned, having been unable to find the Biologist, and we accepted an invitation from the Kentucky lady to dine with them that evening at the hotel next.

We had work to do that afternoon and were late. We found ourselves the only guests in the large wood-panelled dining room. The lone waiter set a table for us with obvious reluctance. It was past seven o'clock, and the other chairs and tables were piled against the wall for the morning sweeping. Our slowness in ordering the dinner did not put the waiter in any better humor, but the Doctor could not decide on anything, and it was not long before I thought we should have taken him to a sanitarium instead of an hotel. We suggested that he might like the shrimp, but instead of answering, he grabbed one of the well-kept hands of the Kentucky lady, and holding it up for us to see, shouted loudly:

"Look at this! My God! Enamelled fingernails! And she's a lady! The nasty—!" He flung her hand against the table with disgust. The Kentucky lady tried to soothe him as if he were a child, but he would have none of it. He must see it through and, leaning toward me, possessed himself of a hand of mine. He was about to burst out

again when to his amazement he saw that my nails were not enamelled. The epithet stuck in his throat; he almost wept in relief. He began to caress my hand, murmuring how right this was, how nice, this was an artist's hand, this hand was like his sister's, she was an artist, too, one of the best portrait painters in England. How he missed his sister, she was the only one who understood him! We suggested again that he might like shrimp, or would he prefer turtle, but he burst out that the Captain was accusing him of drink, which was a lie. His heart was very bad. Had never been right since the war. He was ill, ill.

"Perhaps the turtle would help," I told him.

Yes, that was it, that was a good idea. "Bring us turtle, waiter, and quick. Do you expect us to wait here all night?"

We had turtle, and the rest of the dinner, also, was picked according to what was good for the Doctor's heart.

Throughout the evening we were told in detail all the happenings on the trip to Bahia and back, and the condition of the Doctor's heart grew sadly worse with the recollection of animosity aboard and the persecutions he endured at all hands save those of the Kentucky lady, enamelled though they were. The noise from one small table seemed curiously large in the big empty room, but suddenly it was drowned out completely by a shout coming from somewhere inside the building. We were all of us silenced, wondering what it was. It arose again, this time from many throats, and was repeated with mechanical precision. It was the utterance of a crowd, but an organized crowd. The waiter assured us that he knew nothing about it. We saw a few people moving in the hallway beyond

the dining room, and observed that there was a man there apparently checking passes. All of the people entering were men, most of them young, and wearing green shirts with some emblem on their sleeves.

Green Shirts—this was the uniform of the Integralistas, patterned on the Nazis. It was quite simple. They were having a meeting here, but why the air of suspense? Why the nervousness of the waiter? The Integralistas were not prohibited by law, as were the Communists. Speeches were being made in the next room and now and then there would be cheers or the men would break into singing which carried more energy with it than any we had heard elsewhere in Pará.

The Doctor, finding that he was not in danger, renewed his personal laments, and the dinner continued to its end, the Doctor's voice rising higher and higher, to be heard above the singing of the Integralistas.

When we stepped out into the quiet street, the peaceful square we knew so well had about it an unreality. The hysterical Doctor and the militaristic chantings, the other side the wall, had put upon me an apprehension, and I expected with our movement to meet a scene whose look had changed during the past hour. I was so convinced of this that the normalcy which the square maintained was the unreality. But with the appearance of a figure emerging from the tree shadows into an area of lighted street the normalcy was intensified into reality and I knew completely that nothing had changed for a quarter of a century. The Zoologist was taking his evening walk. He was moving with his usual quick step, head and shoulders thrust slightly forward, and under his arm, black against

his white coat, his big umbrella. The sky was bright with stars but the Zoologist and his umbrella were inseparable.

We put the Kentucky lady and the Doctor into a taxi headed for the ship and turned to the Zoologist to inquire where he had dined, explaining that we had been at the hotel next and had hoped to find him.

"No, I was not there tonight. I dined at a restaurant near the Gardens."

"And how was it?"

"Ach! The same! Cow—always cow!"

Beloved Zoologist! Of course nothing had changed; the world will always turn on its axis! No matter if there are Integralistas and shell-shocked doctors, disorganized and lost, and—fish stories with an appalling social implication and—scientists and artists wanting to remake the world and—politicians moving through the midst of the people, or over them—there will still be Zoologists and there will still be cow—always cow! Let us be comforted!

"I have just come from the Attorney General's," the Zoologist was saying. "He will recover; the crisis is passed; it will be slow but he will recover." There was a note in his voice I had not heard before and I felt that if I looked at him, I would see that the firm lines of his face were wavering.

With the Zoologist's words I felt suddenly a gladness; this was surely the day on which to hear such news, and I knew now, thinking of the Attorney General, that whatever his title he was at heart a scientist and an artist, and on these grounds we bore a kinship to one another.

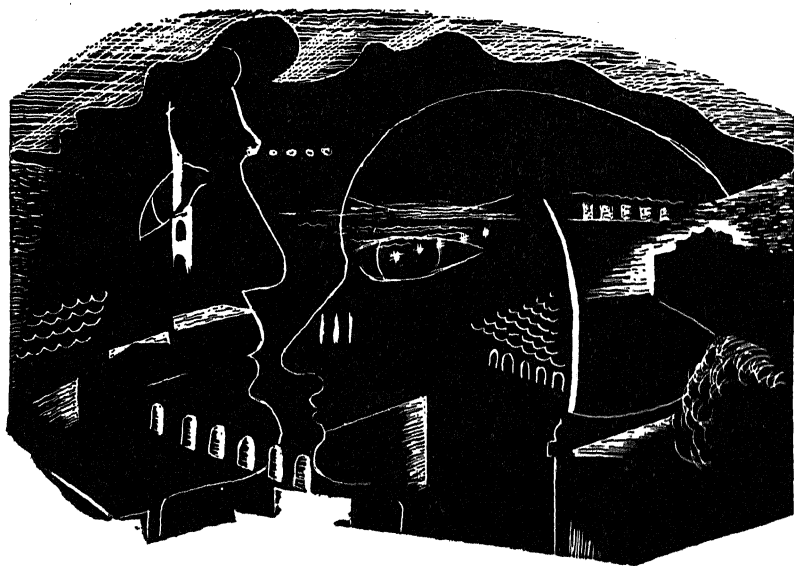
The Physicist and I returned to our hotel and I felt grateful for the dark quiet of our room and moved across

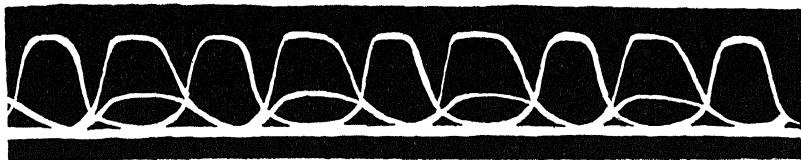




it to open the shutters, closed against the heat of the afternoon sun, and lean forward to feel the cooler air. The city lay in a flood of moonlight, whose cold blueness could not wash from the roofs their warmth of tone. There was no positive color note to differentiate the houses but the whole was fused into a vibrating warmth which rose, caressing against the eyelids, even as the confusion of insect sound at this distance became a harmony against the ears. The beauty and order of the sleeping city was by its very abstraction as heartening as the vital human news of the Attorney General.

Hope is still in the box.





23. ADEUS SANTA MARIA DE BELÉM!

“HEY, THERE—get up and hurry. We’ve got to ship those eels today!”

I recognized the familiar tones of the Physicist, booming at the Biologist next door. “More eels!” I thought and turned over and deliberately shut my eyes. But the Physicist was upon me, too, reminding me that our good Captain had promised to deliver what eels we would to the Physician in New York and the ship was to sail this morning. We had not intentionally put this off so long, but eels, alive or dead, could not be sent by ordinary freight and only the good offices of the Captain would now make it possible.

The getting of those eels aboard fell to my lot, and it takes its place among those Brazilian hardships, of which the procurement of the twelve empty bottles was typical. The Physicist and Biologist had chosen six good-sized specimens, about four feet in length and healthy. Three were to be sent in alcohol and three on ice. The eels were killed quickly and packed accordingly. Those on ice were put in a wooden box with sawdust for insulation. These two rather sizable packages and I were put into a taxi and wished Godspeed. I was to take them to the office of the

steamship of which the Captain was in charge, for a certain permit, and then aboard the ship. I already had one permit from the Zoologist, allowing the eels to leave the country, and could see no further complications. But they were there, waiting for me at the office. They were presented by a reedy, small-headed Englishman, who informed me that I did not have the other permit.

"What other permit?" I shrieked at him, sensing what was ahead of me. I shall never forget the patience of those people. It went on and on— I was to do this, go there, get the thing necessary, and eventually the eels could be put aboard.

"But," I said, "the ice is melting."

"What ice?" the reedy gentleman inquired as though I had changed the subject. I explained. He was rather shocked at the idea of the eels being there at his front door, and went out to see for himself.

Water was already beginning to trickle through the cracks in the box on to the floor of the taxi. He was convinced, and also sorry that there was nothing he could do about it. I went back into the office with him for written instructions. An hour more of this and the iced eels would be fast on the road to spoiling. There would be no change of weather here, I knew. Water was trickling from my whole body as though I had been a cake of ice, also—but I felt like a hot coal.

As I left the place again, one of those chance mercies met me. Entering was the Captain. I waved the papers and addresses I was carrying at him, and motioned toward the taxi. Words were beyond me. The Captain looked and seemed to understand. He pushed me into the

taxi, gave an order to the driver, and got in himself. In five minutes we were crossing the gangplank, the Captain and the driver carrying the eels. They were rushed into the ship's refrigerator, and I was too relieved even to ask how it had happened.

"The gods must have sent you!" I thanked the Captain and, "Tell me," I continued, "I've been worried about the Doctor. How is he?"

I expected a round oath, somewhat muffled, due me as a lady. But it did not come; instead, the Captain answered with alarm and uncertainty in his voice.

"Bad—thought he had gone across this morning. I sent for him to see to one of the crew who had been hurt. He was trembling so, couldn't even bandage—fell down flat—unconscious. I thought he would never come around. We got him to his bunk, sent for a doctor. He's conscious now but only God knows what's the matter with him." There was no doubt the Captain was worried.

"He's ill, and ought to be in a sanitarium."

"Think so?" The Captain pulled his chin thoughtfully. I said good-by and then remembered the last warning of the Physicist.

"By the way, tell the Physician in New York to be careful when he unpacks the eels on ice. There is *just* a chance that the electric organs may still be able to give a discharge."

The day for our departure also, long marked on our calendar, was now crowding out the other numbers of that month of April sheet. It shot toward us—an ultimatum—23—simple, non-arousing figure, 23. But for us no decipherable complicated code could have carried a more

urgent meaning. All right, that day we will report. Booth Line freighter. Baggage ready, everything as it should be, or perhaps nothing as it should be. In either case, we'll report; we know our time is up. . . .

The last eel experiment at the Gardens was now in progress—the scientists were measuring the voltage in different lengths of the organ. They finish and the Physicist explains. At the anterior end we find 25 volts to the inch. As we make connections farther toward the tail, we find the voltage per inch less and less as the organ tapers off. We make careful measurements on an eel, every two inches. Then we kill the eel and slice the organ every two inches. We measure the area of cross-section of the organ and compare it with the voltage per inch. Not only does the voltage per inch decrease as the cross-section decreases, but there is a constant ratio between the two quantities. At the anterior end there are 25 volts to the inch. Run down the organ until the cross-section is one fifth what it is at the anterior end. Here you find 5 volts to the inch. It is almost an exact relationship. It cannot be a coincidence; it must mean something.

The Biologist has some of the tissue under the microscope. He and the Physicist continue the explanation. Here are the electroplaxes, the units of which the electric tissue is constructed, all regularly spaced. But as we take sections further down the organ, the spacing changes. There are fewer to the inch. Far down toward the tail they are large enough to be seen with the eye.

Here is the explanation of the ratio. Each electroplax has the same voltage, the same electromotive force. Near the head, where the cells are short, there are many to the

inch and their combined voltage is high. Near the tail there are fewer to the inch, their combined voltage is lower.

The organ is made up then of electrical units each having the same electromotive force, about one seventh of a volt. There are molecular processes known in living tissue which produce electromotive forces of about this magnitude. In this the *puraqué* has no special property. But the electromotive forces of other tissue than the electric tissue do not combine to produce the high voltages we find in the *puraqué*. Here is his peculiarity and here is the puzzle.

The high voltages may be produced by joining all the cells along the organ in an electrical series. In this case the voltages would add up as they so clearly do. But at this point two conflicting theories present themselves. It is impossible that the electromotive force exists permanently in each cell and that the connection in series of the cells also exists permanently. For in this case there would be a steady difference of potential of some 300 volts or more between the ends of the organ. This would produce a steady current, for it is inconceivable that the fish has an insulation to withstand any such voltage as this. The materials of which tissue is made are not the materials for this kind of insulation.

Therefore either the electromotive force in each cell is transient or the connection in series is transient. They cannot both be permanent. One or the other must exist only for the brief period of the discharge. Before we can go any further we must find which is the variable. . . .

Time is up. . . . Time up. . . . Time . . .

And then we learned by chance the freighter was not to sail. No official of the Booth line had thought to notify us, cargo being the important thing, not passengers.

I was sent off to protest, quite uselessly, and check what possibilities there were of getting out. I faced the same reedy gentleman who had been so full of counsel the day I had shipped the eels. He was apologetic but no more helpful than on that other occasion. Boats sailed or didn't sail, according to whether or not there was sufficient freight. This time there was not and we were the only passengers. Perhaps there would be a sailing in a month.

A sensation of release flooded me—we wouldn't go after all, we couldn't. Some fate was on our side. The Physicist could finish up his work in leisure, I might find the exact relation between the green trees and the green shadows of the Avenida Nazareth. . . . and then something caught me tight in the stomach. The children. I had deliberately put them out of my life for a period of time. There had been no other way if I was to come at all. But it was to be for three months; what immunity I had against the separation would last no longer, I was certain. If one goes in for children, it is an adventure not to be denied, nor be outdone, even by the Amazon and all its electric eels. I had to go.

I said, "We'll have to find some other way."

The only other way was by air. The Pan-American Airways sent two ships a week to Miami, by way of Trinidad, and claimed never to have had a fatality in its history. We would be at home in two days. It was all very easy except the cost. When we were through figuring this, we realized that we would again incur the debt

liquidated by the Physician, and this we did not want to do. It would have been worth it for a trip to South America, but not merely for a two-day return. At length we found a compromise. We could go by air to Trinidad and there apply for steamship passage to the United States on one of the frequent tourist ships which touched at Port of Spain. The baggage could be sent by "strictly freight."

Experiments must cease, and packing take their place. The oscillograph and trough were disconnected, and the delicate instruments made ready to be put into their cases. The Museum specimens were sealed in their jars or boxes; the pickled eels, now hard as rock and bright yellow-green from the effect of the Bouin's solution, were packed in a large tin box with soldering at every seam. Films with one hundred and ninety-two exposures of the electrical discharge of the eel were sealed in tin tobacco cans, sections of the organs which produced them now filled the once-empty bottles I had had such a struggle to obtain that first week in Pará, and arrangements made for the shipping of two live eels for the Physician in New York. Apparently everything was as it should be and we were pleased that we were managing so well. We had not, however, counted on the customs.

The Physicist calls at the dock to collect the packing cases, but is told there are papers to be filled out, and that he must employ a customs broker. This he does. Papers are filled out—in quintuplicate. Upon completion the customs broker has an unfortunate accident; the papers are dropped in the gutter during a heavy shower—it is the rainy season. They are made out again, but a slight error

is made, for permission to remove the cases was made out in the name of the Physicist, and the cases are held in the customs under the name of the Biologist. What the Physicist said at this point I do not know, but when he returned at noon for lunch, he was throwing his arms about in a manner which demanded as much horizontal space as he required vertically. But even thirty-six and three quarters square feet of indignation had no effect. It was time for all the officers' siestas.

Saturday morning we are notified to have our baggage ready by nine o'clock Monday morning for inspection by the representative of the Bank of Brazil, just in case we might be trying to smuggle out some gold. We are also told that the packing cases at the dock may be called for at ten o'clock also Monday. The Physicist explains that he needs plus twelve hours to pack the equipment, not minus one. The customs broker is sorry but the port is closed over the week-end and there is nothing any one can do.

And then it was a little child who saved us.

Saturday afternoon in Brazil is the time for sweet communion between the generations. Work is suspended till Monday morning, the fathers and grandfathers retire within the bosom of the family to relax, pajamas are donned for comfort, and the little children come into their own. The household of the chief customs inspector is no exception. When the Physicist calls, flanked by the acting American Consul, and the customs broker, both of whom he had forced out of their pajamas at three o'clock, afternoon, please, he finds the perfect picture. The Children's Hour, here the Pajama Hour also, holds sway.

The delegation is courteously received by the chief customs inspector who reclines in an easy chair, his granddaughter on his knee and the ladies of the family surrounding him. The Chief is very dignified, even in pajamas with his granddaughter swarming up his shins. The Physicist explains his plight, but is told in a sympathetic tone that he is asking the impossible. Even if the Chief were to give authorization for the release of the baggage, it would do no good, the port is closed and not even the State can order its opening. The port authority is a foreign corporation chartered in the State of Maine, United States of America. It is only opened in extreme emergency on payment of a fee of five hundred milreis.

All this the granddaughter finds very dull, and makes a bid for the attention of the Chief which threatens his official dignity. He puts her upon the floor, shakes his head at her and gives her a very gentle push. Will the Chief issue an authorization for the release of the baggage contingent on the opening of the port? The Chief smiles at such innocence—this is like asking for release contingent on the sun's not setting Saturday evening. At this point the slowly accumulating resentment of the granddaughter reaches a climax. That shove and the slight suggestion of a frown on the face of her grandfather are indignities to which Brazilian children are not accustomed. She takes up a position behind the consul's chair facing the Chief and makes ferocious faces at the old man. His official dignity totters. He picks up pen and paper and writes the authorization.

"Blessed are the little children!"

The rest is simple. The cases are obtained, the equip-

ment is packed, the representative of the Bank arrives as scheduled, carrying an umbrella and an Integralist book, the Brazilian counterpart of *Mein Kampf*. He asks us to provide him with paper, pencil, and glue, and slaps across our baggage "Banco do Brazil." The rites are complete, we may now depart.

The Zoologist with Chico in his arms stands in the doorway of the laboratory. He is saying, "Here is Chico for your boy in America. I will arrange to send her up with the next shipment from the Gardens."

I had tried, unsuccessfully, to get a wooly monkey to carry home, for this most friendly species is hard to obtain, even in the tropics.

"But," I protested, "I can't take Chico. She is your baby!"

"But yes."

"But you will miss her."

"There are others——"

I felt that the situation was becoming emotional, and hastened to accept, but feeling as though I were destroying a most happy parent-child relationship. And Chico, unaware of her fate, held out a friendly hand to me. I shook it formally.

"Till we meet again, Malandro macaco!"

To this city and these people we say farewell, warmly, for what they have given us. The Gardens, the El Greco worker, the shy, chattering monkeys, the Texan; the memory of these and so much else has now become a part of us.

Three months is not really so short a time. Only a millionth of a fragment of this time is needed to create or

destroy life, and by this reasoning the accomplished act of any moment exists forever. All right, so we will have it for Pará. We will acknowledge the spell it has put upon us. We will shut our eyes in the gray northern winter and feel its warmth, and see the shining colors those quiet people see fit to paint their world about. And underneath the visual expression of this rich world, we sense life moving slow and strong, with a quality always a little secret and inexplicable to the northerner, and bringing with it some quality of dormant power we would ponder and try to understand.



Mounting into an airplane for the first time is no matter-of-fact procedure. For who could be insensitive on the threshold of a new world?

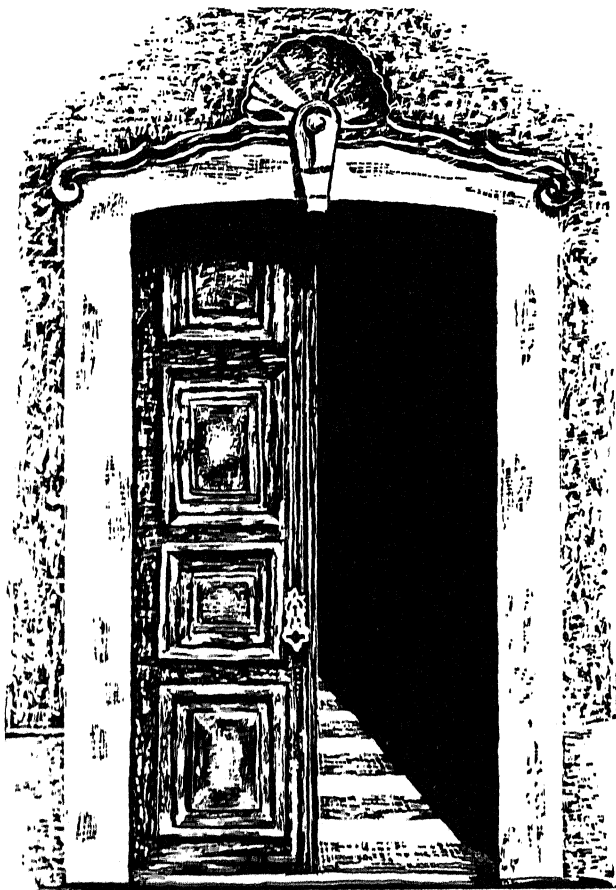
The plane slid upon the water with a roar and mounted into the clear air on so gradual a diagonal that the ascent was scarcely noticeable from within. We sat, with our faces pressed against the window glass, watching the receding familiar earth. With the diminishing and eventual disappearance of man, his planet enlarged in reverse proportion, until all contact with him ceased, and we could gage no longer the relative size of things. The area we saw below us became measureless, it might stretch one mile or a million.

No radiance of color under mango trees, no sound of ancient tram cars, no soft-treading burden carriers, no brown, naked children, no old black man with a boa constrictor, not even a writhing shocking eel exist down there. That was all fantasy. In reality the world is a painted sheet, half green, half brown. There is only the jungle and the dark waters of the Great River pushing back the clear ocean.

Up here we rush on with scarcely a sensation of movement except for an occasional jerk as the plane enters a cloud. It is quick and short like the motion of a bucking horse. But it is clear today and we are out in an instant looking toward the vague blue line of the earth's circumference, or wondering what is that phantom plane riding to the left of us. It is no phantom but as solid a shadow as you may find, the shadow of our plane upon a cloud. When a cloud is at a certain distance the entire shape of the plane rests upon it encircled by a rainbow.

This shadow and its accompanying spectrum move upon the cloud as we move in the free air, yet so detached from the substance of the plane that it seems to carry its own entity. So we move northward with this escort, as beautiful and as intangible as the memory of that other living we have touched and begun to love down there.

Adeus, Santa Maria de Belém!



In our northern world there is no assurance to allow such leisure. The very change of seasons puts upon us an obligation to record their movement. There is a quickening of perception at the coming of the barren winter no less than at its ending. When fall is nearly through there are intervals so complete in beauty that we are betrayed momentarily into the belief that they are fixed. Then suddenly we remember the last winter, and the still red glow of the maple leaves, the purple red of the hawthorn berries, the misty lavender of a few branches already bare, gathered together in the corner of a city park, become too poignant for our peace. We cry out, "Don't, don't look like that, it is treachery, tomorrow I know you will be only dull gray lines, scratching a duller, grayer sky. . . ."

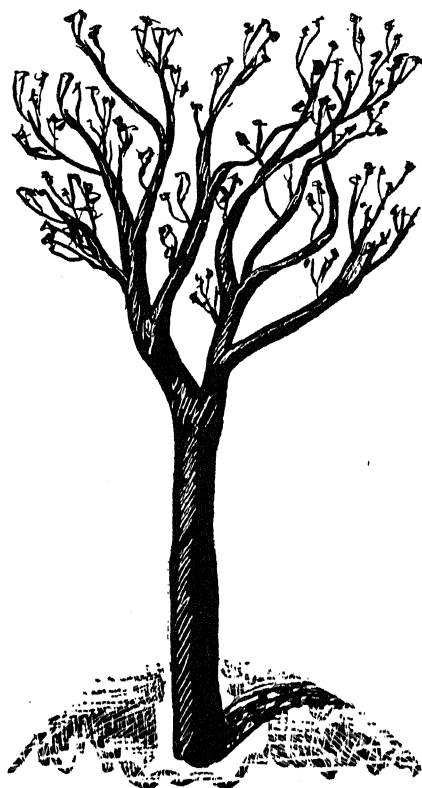
But we live through the winter, we live through many winters, and always there is the spring. This spring to me is unlike any other, coming after summer. I look across the park with a more acute perception. On a little rise of ground, a miniature hill, a young maple is experimenting with this new life. The smooth, upgrowing branches are fringed with yellow-green. I cannot see the individual leaves, but I know the way they look from another spring. They are crinkled and moist like the wings of a moth emerging from its chrysalis; they are not made to fly, but they will dance, how they will dance in the smoke-filtered sunlight!

"Brr! . . . Cold. Why did we ever leave Pará?" The Physicist turns up his coat collar and continues, "Why do people live in this God-forsaken frigid zone? This . . ." His moans trail off into the depths of his coat collar.

We have not yet passed out of sight of the little maple; I can see it over my shoulder. That particular yellow-green, there is no other like it anywhere.

"But," I say, motioning toward it, "the little yellow maple. . . ."

The Physicist does not hear me; he is lost in his coat collar, longing for Pará.



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